



# AERIAL

FIREPOWER

A SUMMIT PRODUCTION





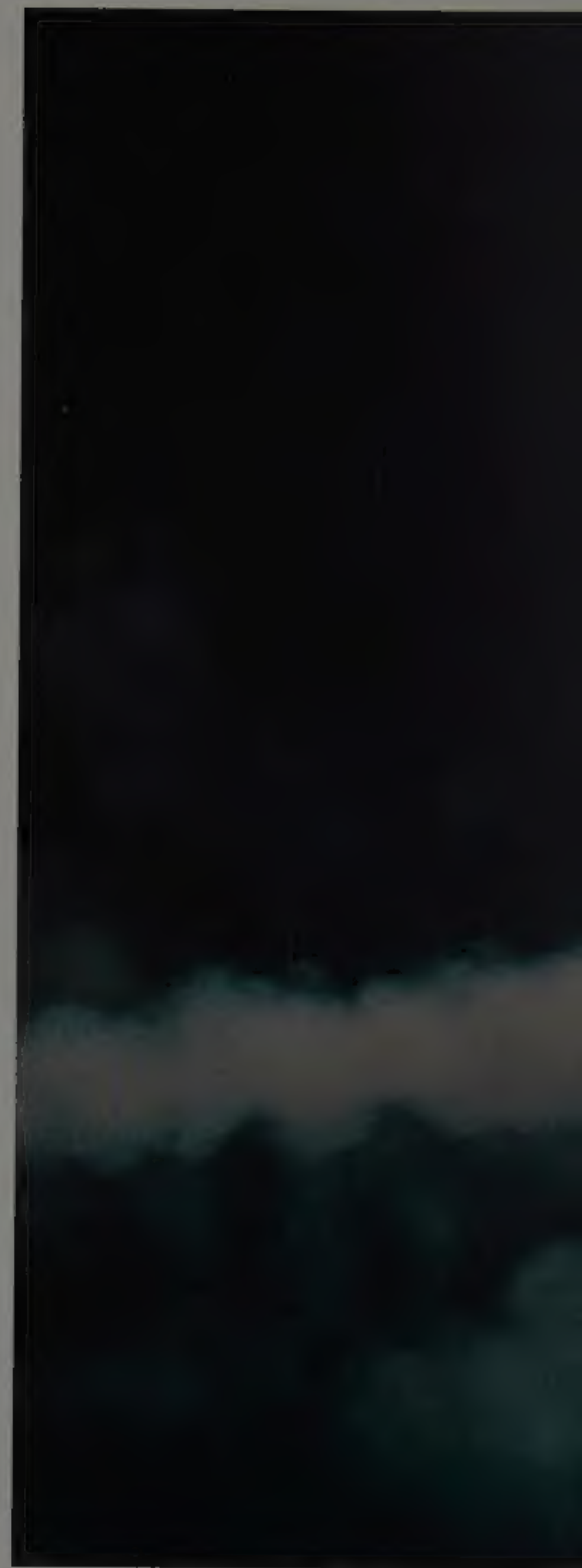






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**LINDSAY PEACOCK**



**GALLERY BOOKS**

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# INTRODUCTION

**T**ODAY, AERIAL FIREPOWER is at its most bewilderingly diverse, that diversity encompassing not only the weapons which may be delivered from the air but also the flying machines that are tasked with carrying those weapons to where they may be most effectively discharged against a target.

These are both areas in which great improvements have been made and even the most uninformed observer ought readily to acknowledge that current warplanes — whether they be fixed-wing or rotary-wing — have about as much in common with those of World War II as

the sword has with the humble club, even though the basic purposes are the same. But what are those purposes?

In essence, aerial firepower falls into two primary disciplines. Air-to-air combat is one and, despite the vociferous protests from the world of the “mud-movers”, this is still easily the most glamorous role. The explanation is simple and stems from the fact that aerial combat is largely perceived as being almost “gladiatorial” in its nature, a perception encouraged by a seemingly endless list of book titles describing the actions that have been fought out in the skies since man first had





the idea of hanging guns on aeroplanes.

In the process, he set the stage for a return to something approaching the mediaeval philosophy of individual combat and there is certainly something heroic about the idea of the "aerial duel", with death being the only reward for the vanquished. In view of that, it is hardly surprising that books which relate aerial encounters in intricate detail should continue to find such a ready audience, nor that they should rank so highly in any list of "aerial best-sellers".

The second primary discipline is air-to-ground and this is, in many ways, much

the more interesting, even though it tends to suffer from a "poor press" when compared with air-to-air. The explanation for that is almost equally simple to pin down and must surely stem from the notion that it is essentially impersonal and far removed from the "chivalry" that is often felt to be a factor in airborne battles.

When all is said and done, for some strange reason, most people feel that dropping bombs from an aircraft is a "dirty" way to fight a war, conveniently overlooking the fact that many of von Richthofen's victims were by no means flying what could honestly be described as

"fighters". In reality, of course, chivalry really has no place in modern warfare and one has only to look through the pages that follow to appreciate that the modern warplane and its weaponry are designed to achieve the objective — whether it be the destruction of another aircraft or the obliteration of a target on the ground — with maximum efficiency and minimum fuss.

When we come to consider the types of vehicle which may be employed to project power from the air, the terms of reference that once used to apply have become ever more blurred and nowhere







is this more evident than in the world of the "fighter". Whereas we once had aircraft which were conceived for nothing more than the job of destroying other warplanes — recent examples include the Convair F-106 Delta Dart and the English Electric Lightning — many modern "fighters" are almost equally adept in aerial combat and air-to-ground missions. Perhaps the finest instance of this multi-mission capability is the McDonnell Douglas/Northrop Hornet which uses the designation F/A-18 to indicate its utility and versatility.

When it comes to bombers, even here the familiar terms of reference have changed almost beyond recognition. Admittedly, the USA has Boeing's B-52 Stratofortress and Rockwell's B-1B and may obtain Northrop's B-2A, but, like the once-mighty battleship, the big bomber is in danger of becoming an anachronism and a scarcely affordable one at that.

Hugely expensive weapons systems such as the B-2A are increasingly at risk at a time when defence budgets look certain to contract on both sides of the Iron

Curtain. To the east, such cuts appear to be driven by the desire to drop out of the "arms race" and divert money into matters of a more peaceable nature. To the west, the clamour for reduced military spending is in large part motivated by a perception that the threat from the East is diminishing.

In the face of what looks like being an era of relative austerity when it comes to matters military, it is by no means inconceivable that Northrop's "stealth bomber" may yet prove to be the last in a long and illustrious line.

Almost as a by-product of the cost-versus-affordability equation, a new generation of less expensive but still most capable aircraft has emerged. Known as strike fighters, these warplanes now fulfil most of the roles that were once the province of pure bombers. Instances of strike fighters include the General Dynamics F-111, Panavia Tornado and Dassault-Breguet Mirage 2000N and all of them are able to operate in either nuclear or conventional attack roles, possessing the ability to fly long distances and deliver of-

fensive weaponry with great precision by both day or night, fair weather or foul.

As far as the general public is concerned, military aircraft possessing warlike potential are almost inevitably classed as "fighters" or "bombers", an opinion that is daily reinforced by the representatives of the media who seem to take great delight in reducing virtually everything to no more than a few simple and all-embracing categories.

In reality, of course, the picture is very different and contemporary air power encompasses a rich miscellany of flying machines. Indeed, it seems that virtually anything that you can hang ordnance on can now quite legitimately be described as a warplane. Thus, flying machines that would have been classified as pure trainers in the past may now find themselves meriting consideration alongside purpose-built warplanes, as do helicopters which are now widely viewed as being amongst the most efficient and formidable practitioners of the ever more deadly art of warfare.

All of these classes of aircraft find a





place in this volume, as do many of the weapons that they employ and it is in this area that change has perhaps been most evident during the past few decades.

The longest-serving air weapon is of course the gun, and after a period when it was considered by many to be little more than an unnecessary luxury, this device is now very much a part of the contemporary fighter's armoury. Cannons delivering high-explosive shells are extensively used by both the air-to-air and air-to-ground fraternity. In the west, 20mm is easily the most favoured calibre and is best epitomised by the classic Vulcan M61, while there are few weapons that can match the awesome potential of the GAU-8/A Avenger 30mm cannon of the A-10A Thunderbolt II "tank-buster".

In essence, cannon armament has changed but little, unlike the bomb which has been vastly improved. More potent explosives have been incorporated into conventional weapons, resulting in more

destructive power for a given weight and these changes have gone hand in hand with efforts to bestow greater accuracy. Thus, modern bombs often make use of a modular concept whereby "bolt-on" nose and tail sections of varying types may be joined to a centre section containing the actual explosive.

Such additions encompass retarded and "slick" fins as well as guidance segments which, for example, may be used in conjunction with a laser designator to ensure near-pinpoint accuracy. Changes of this kind have been accompanied by new modes of delivery and "toss" or "lob" bombing is now a recognised tactic for hitting a target without having to physically fly over it. Of course, the attacker must ensure that the right delivery mode is used for the right weapon. By way of illustration, no one in his right mind would attempt to "toss" a retarded bomb and nor would it be altogether wise to use the "low-level lay-down" technique to deposit





a "slick" weapon.

Finally, there are the missiles and this is certainly one area where change is readily apparent. Air-to-air missiles have been much improved in recent times and nowhere is this process more evident than in the case of the heat-seeking Sidewinder. Adoption of a much more sensitive seeker head has been largely responsible for transforming the AIM-9 into a much-feared weapon and one that now possesses "all-aspect" capability as it has shown only too clearly in the two exchanges between US and Libyan fighters as well as during the battle for the Falkland Islands.

At the other end of the range scale there is the Hughes AIM-54 Phoenix. Used only by the US Navy's F-14 Tomcat fleet fighter, this has yet to be employed in anger but has demonstrated the ability to kill at extreme range on a number of well-documented occasions.

In the air-to-ground arena, the picture is still more imposing, missiles that are

currently in use or development being designed to "take out" virtually every conceivable type of target on land or sea. From TOW to ALCM, these offer a vast variation in destructive power and at the nuclear end of the scale they are complemented by the awesome destructive potential of the mighty ICBMs.

Less evident but no less important are the changes that have taken place beneath the skin of the modern warplane and it is probably fair to say that it is in this area that by far the greatest strides have been made. Purpose-built machines such as Tornado are dependent upon an almost fearsomely complex array of avionics equipment if they are to perform their designated mission in a satisfactory manner while even the less sophisticated "warplanes" such as Hawk 200 also embody a suite of avionics gear which is infinitely superior to that of many fighters of the fifties and early sixties.

To some extent, all of this "magic"

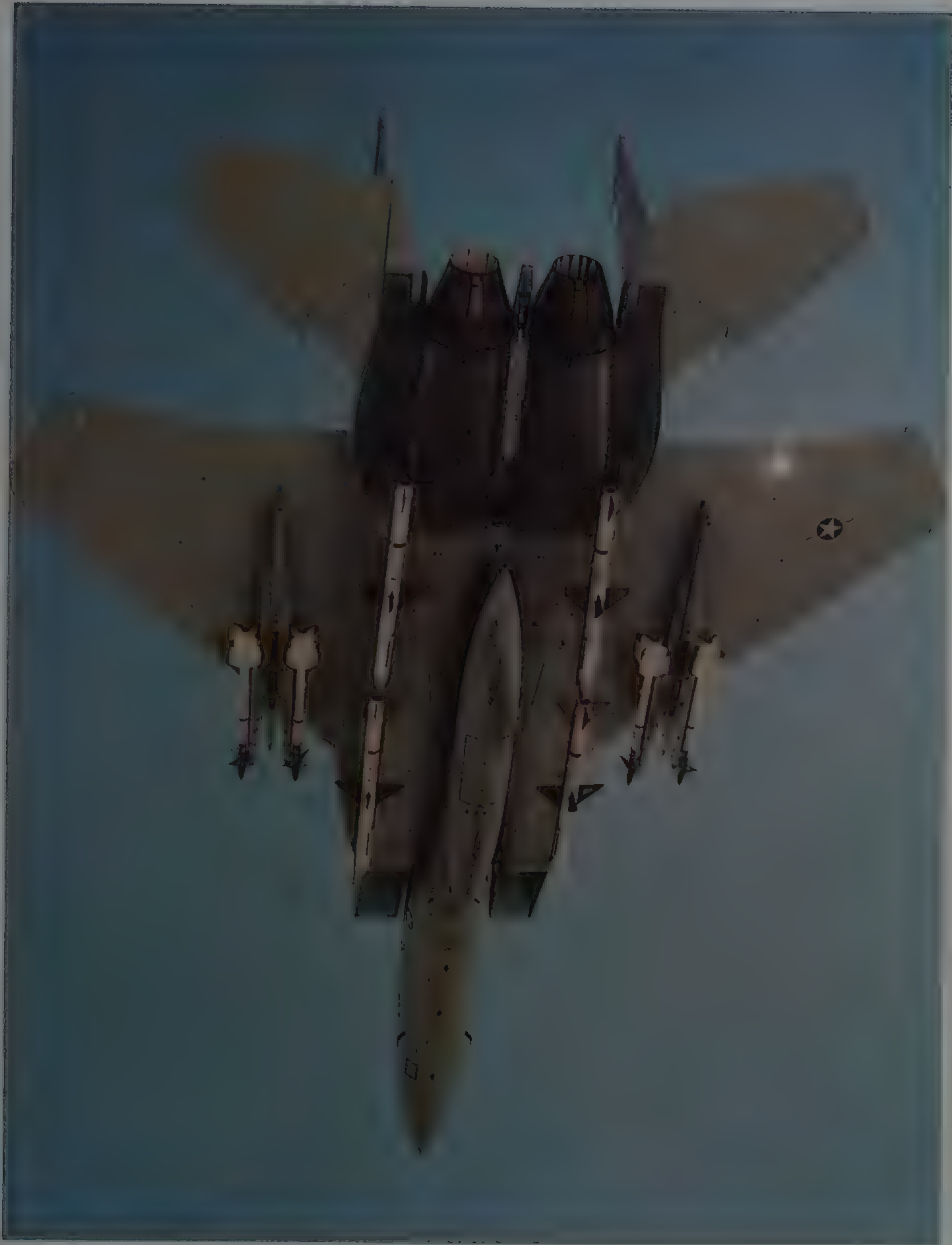
equipment has resulted in pilots facing the risk of being saturated with data relevant to the task and it is in this area that the computer age has come to the rescue. Today, more than at any time in the recent past, computers are vital pieces of "kit", being used to assist in an ever-expanding list of functions such as management of weaponry and prediction of weapons release points, flight plan and navigation requirements, control of electronic countermeasures equipment and even control of the aircraft itself.

In the process, the increased emphasis placed on the use of the latest "high-tech" equipment has changed the nature of flying almost irrevocably and those who now occupy the cockpit might more accurately be described as systems managers rather than pilots. In the foreseeable future, however, the skill and courage of highly-trained and dedicated aircrew will remain an essential element of all forms of aerial firepower.

Some idea of the thrill of being at the controls of the F-15 Eagle can be gained from the study of an Eglin-based aircraft indulging in a near vertical climb (right). Like all warplanes, however, the Eagle is designed to fly and fight, its mission of air superiority dictating good armament capability. This is shown to advantage (below) where a radar-guided AIM-7 Sparrow is loosed off at an unseen target or on the opposite page where an F-15C totes a full complement of four AIM-7 Sparrows and four AIM-9 Sidewinders.













With "shock-diamonds" forming in the fiery afterburner flame, an F-15A Eagle of the 122nd Tactical Fighter Squadron at New Orleans, Louisiana makes a striking subject against a backdrop of dark blue sky. In use with second-line elements of the Air National Guard for a number of years now, Eagles have a vital part to play in the protection of US airspace and this responsibility has now largely passed to outfits of the ANG. This particular Eagle is lightly armed, with just one AIM-9L Sidewinder to be seen, whereas an aircraft engaged on alert duty would normally carry a mix of short range Sidewinders and medium range Sparrows.







Originally conceived as a lightweight air superiority fighter, the General Dynamics F-16 Fighting Falcon is now far removed from that simple philosophy and is very much a multi-role warplane. Air-to-air applications are shown here, with a two-seat F-16B launching an AIM-9 Sidewinder infra-red missile (opposite), an F-16C carrying pairs of AIM-9 and AIM-120 AMRAAM (left) and an F-16A with a full bag of four AMRAAMs, one of which is seen accelerating away, a few moments after leaving its launch rail (below).

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As the US Navy's number one interceptor, this F-14 Tomcat naturally takes precedence over an F-18 Hornet in the view at left which shows carrier deck activity as a launch sequence is about to get under way. Above, Tomcat is seen aloft, in its natural element, this AIM-7F Sparrow and AIM-9L Sidewinder-armed example displaying the skull and crossbones insignia of VF-84 "Jolly Rogers" squadron as it undertakes a combat air patrol mission well away from its parent aircraft carrier, the nuclear-powered Nimitz. For really long-range kills, the Hughes AIM-54 Phoenix AAM would also be carried.







Fleet air defence is the main mission of the Grumman F-14A Tomcat, the latest and quite possibly the last "feline" to be built by this well-known manufacturer and arguably the most potent interceptor ever to see operational use from the flight decks of US Navy carriers (above left). Armed with both heat-seeking and radar-homing air-to-air missiles, Tomcat is still the only fighter able to employ the AIM-54 Phoenix with the ability to engage multiple targets at extreme ranges. Six Phoenix missiles are carried by the VF-32 machine (bottom left) while the above picture portrays a missile of this type at the moment of launch.







Despite problems experienced with the radar, the Royal Air Force's Tornado F3 Air Defence Variant (ADV) has matured into a potent interceptor able to counter threats at medium and short-range. The fighter version of this multi-role aircraft carries four Sidewinder and four Sky Flash air-to-air missiles as well as a single Mauser 27mm gun. Full missile armament is shown on the two upper pictures which portray F3s from No.229 Operational Conversion Unit (left) and No.29 Squadron (right) while one of the older F.2s, lets go of a Sky Flash during a live firing exercise.



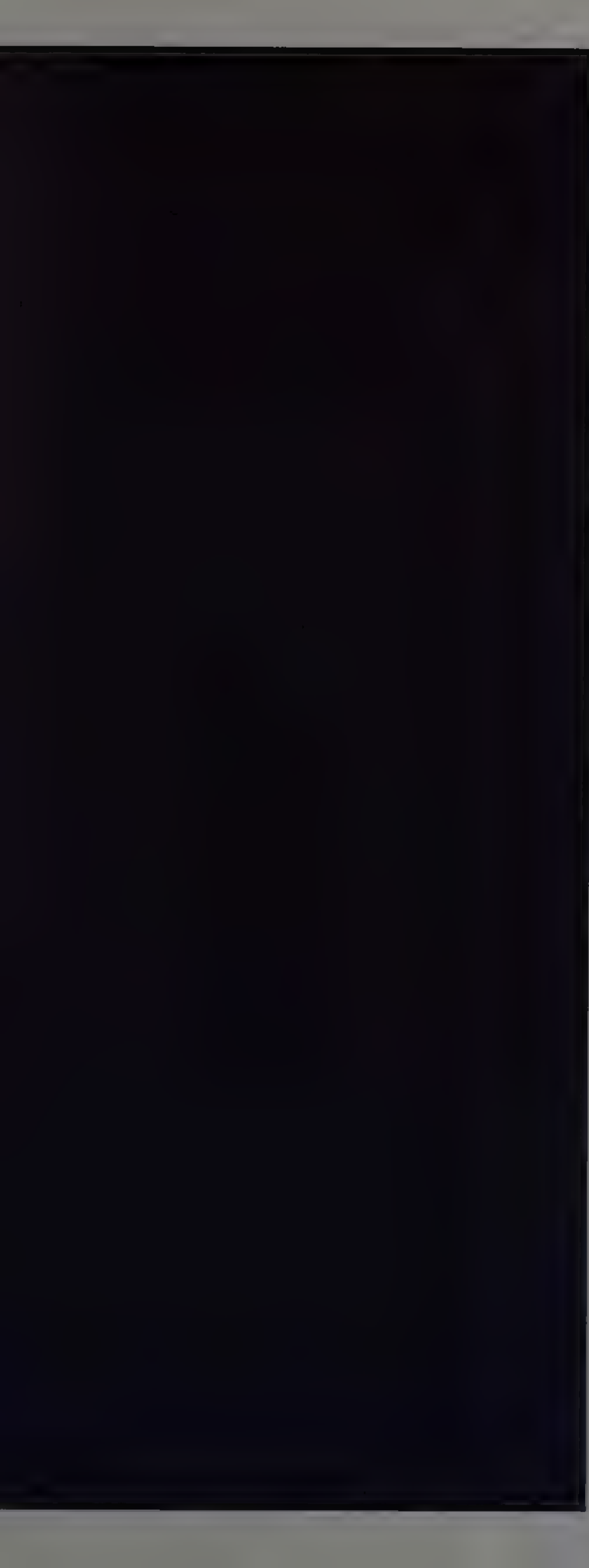




Night launch by RAF Phantom!  
Time-lapse photography at the  
RAF base at Leuchars captures  
the fiery trail traced by a No.111  
Squadron Phantom FG.1 as,  
driven by two Rolls Royce Spey  
engines working at full bore, it  
accelerates down the runway  
and heads skywards at the start  
of a night sortie.







Standing out sharply against the chill waters of the North Sea far below, an RAF Phantom FG.1 cruises serenely along as it prepares for a practice intercept exercise during the course of a training mission. An inert AIM-9L Sidewinder acquisition round is visible under the starboard wing and a conformally-fitted Sparrow will also be present to provide the radar operator in the back-seat the chance to train realistically for the day when he might have to use such weapons for real. Nose and tail insignia offers proof of assignment to No.111 Squadron, the one-time "Black Arrows" aerobatic team and now more familiarly known as "Treble-One".







Winning its "spurs" in 1982's battle for the Falklands, the air-to-air adventures of the British Aerospace Sea Harrier are well known. This striking study depicts an FRS.1 with a pair of auxiliary fuel tanks and a quartet of AIM-9L Sidewinder missiles, the latter earning itself a fearsome reputation in the aerial encounters that took place above the chilly South Atlantic waters. Continuing development of the Sea Harrier will soon lead to deployment of the more potent FRS.2 which is to introduce a new multi-mode radar offering the ability to engage several targets simultaneously plus compatibility with the fire-and-forget AIM-120A AMRAAM.





France has achieved a measure of success in developing and deploying missiles for use in air-to-air and air-to-ground operations, with much of the credit for this state of affairs resting with the MATRA company. Examples of the medium-range MATRA 530 missile are shown here being carried and fired by another notable French success story in the shape of the Dassault-Breguet Mirage 2000. Several variants of the Mirage 2000 now serve with the Armée de l'Air as pure interceptors and on "mud-moving" missions while it has also secured a number of worthwhile export orders, in the process making a significant contribution to France's balance of payments.





French determination to meet their own fighter needs has led to the development of several variations of the Mirage with the latest 2000 being by far the most impressive member of this hugely successful family of warplanes. Mainly tasked in the air superiority role, it is usually armed with the short-range infrared homing Matra Magic missile which is shown being launched (below right) while inverted. On the opposite page, a 2nd Escadre Mirage 2000 armed with Magic and the much larger Matra 530 heads straight up against an imposing backdrop of snow-covered mountains while the view at right portrays a test aircraft fitted with a brace of Magic AAMs and the Apache weapon system. This system dispenses various types of sub-munition.











France's Dassault-Breguet has established a fine tradition of building highly functional and elegant fighters for the home market although these usually also succeed in securing good export contracts, thus making useful contributions to both the manufacturer and state. A new fighter, known as Rafale, is now under development and this forms the subject of the accompanying pictures. While it certainly scores highly on aesthetic grounds, some time will have to pass before its true worth can be assessed.

(Overleaf) Matra Magic AAMs are visible on the tip rails of the Rafale prototype as it flies low over the sea. Naval and land-based derivatives of this Dassault-Breguet product are due to enter service with France's Aeronavale and Armée de l'Air in the 1990s.







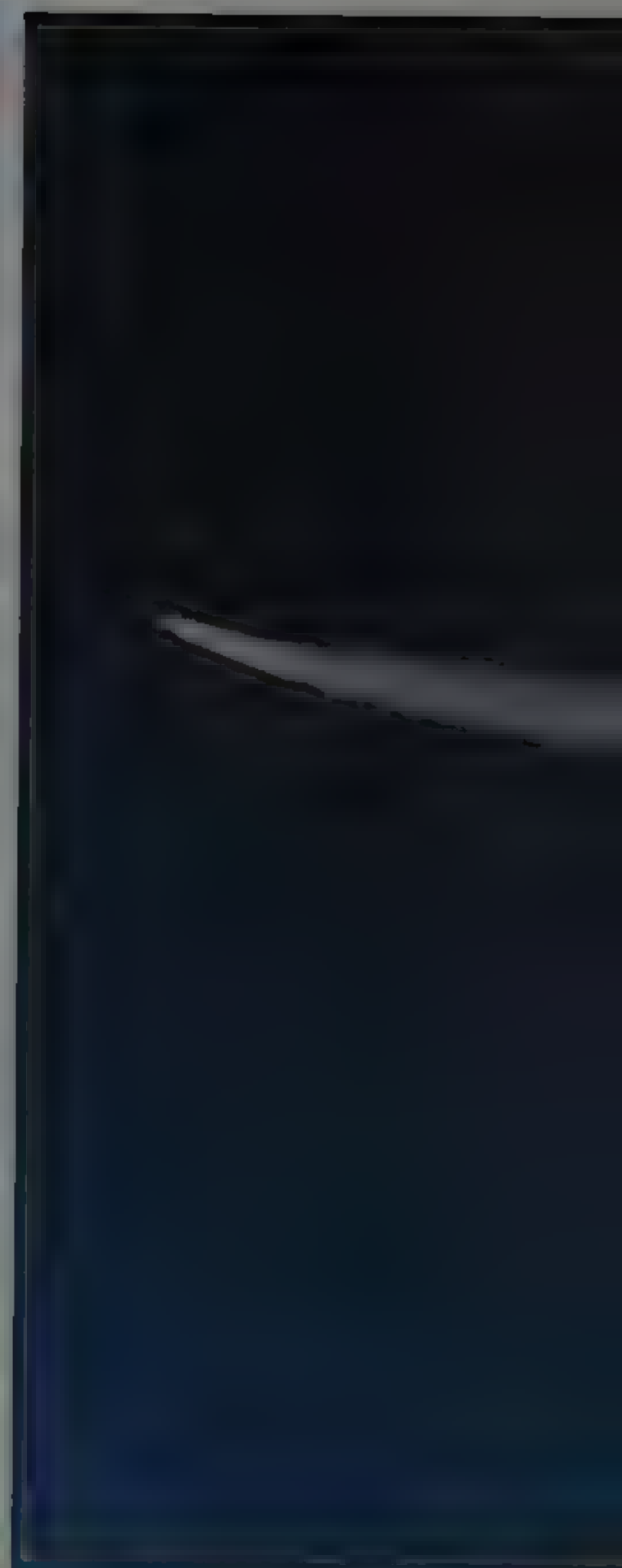




The evolutionary process has transformed the heat-seeking Sidewinder air-to-air missile from a weapon that was often far from infallible into one that is now much feared. The AIM-9L (above) was the first "all-aspect" version to make its debut and its ability to home on skin friction is all too clearly revealed on the opposite page where a hapless PQM-102 Delta Dagger target drone meets its demise.





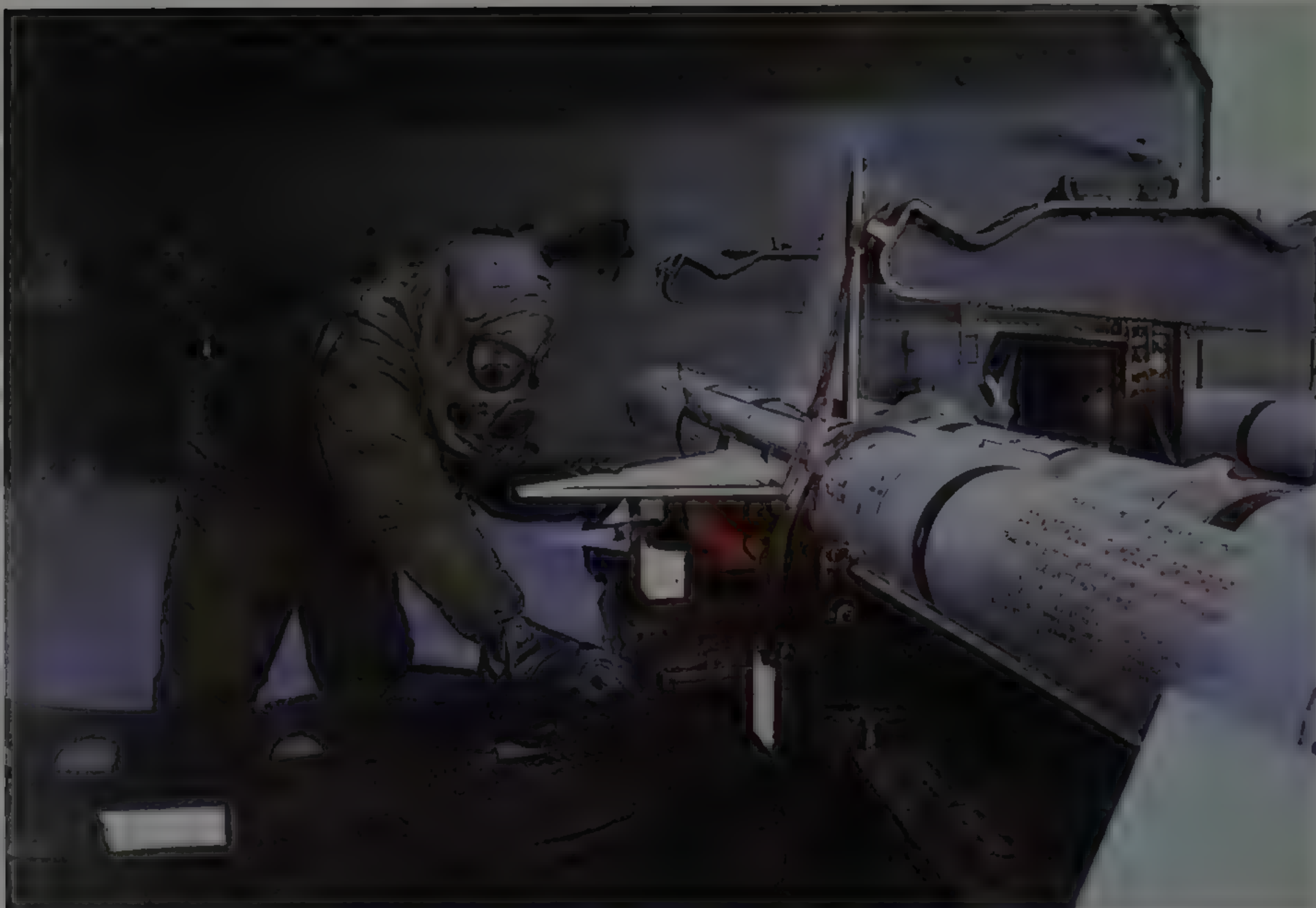




Despite its age, no effective successor has yet been found for the Sidewinder heat-seeking air-to-air missile and nor does a replacement look probable in the near-term future. Still a remarkably simple weapon, examples of the latest AIM-9L variant are shown on an F-16 Fighting Falcon of the USA's Tactical Air Command (top left), being fired by F/A-18 Hornet of the US Marine Corps (left), striking a pilotless drone target (below) and just after launch from an RAF Tornado of No.15 Squadron (far left, below).







Still the most widely used radar-guided missile in the west, the AIM-7 Sparrow isn't exactly renowned for reliable performance as was shown by the encounter between US Navy Tomcats and Libyan MiG-23s at the start of 1989. Despite that, most adversaries would treat it with respect for it is quite capable of spoiling anyone's day. In the view above, a weapons specialist in cumbersome NBC protective kit prepares a Sparrow for loading while the studies opposite show missiles of the Sparrow family being fired by an F/A-18 Hornet (top) and an F-15 Eagle (bottom).









Similar in size to the widely used AIM-9 Sidewinder, the French MATRA Magic air-to-air missile is also a "heat-seeker" in that it is designed to home on infra-red energy sources such as engine exhaust nozzles. Magic may be found on a variety of warplanes and types which carry it as a matter of routine include the Jaguar (above left), Super Etendard (left, in Argentinian insignia) and Mirage 2000 (far left).







"Trolling for Bear": NATO co-operation is exemplified by this fine picture of fighters from both Britain and the USA escorting a Soviet Tu-20 Bear engaged on electronic reconnaissance "ferret" duty. The 57th FIS F-15C Eagle appears to be carrying just a pair of AIM-7 Sparrow missiles unlike the No5 Squadron Tornado F3 which has a full complement of armament, including AIM-9L Sidewinders and Sky Flash.







Undeniably one of the ugliest of contemporary warplanes, in its natural element even the A-10A Thunderbolt II can take on a pleasing appearance as these two views of a lightly armed 81st Tactical Fighter Wing "Warthog" in close proximity to an aerial tanker confirm. In the left picture, the nose-mounted refuelling receptacle is clearly visible as also are some of the many under-wing hardpoints, only one Maverick missile being carried.

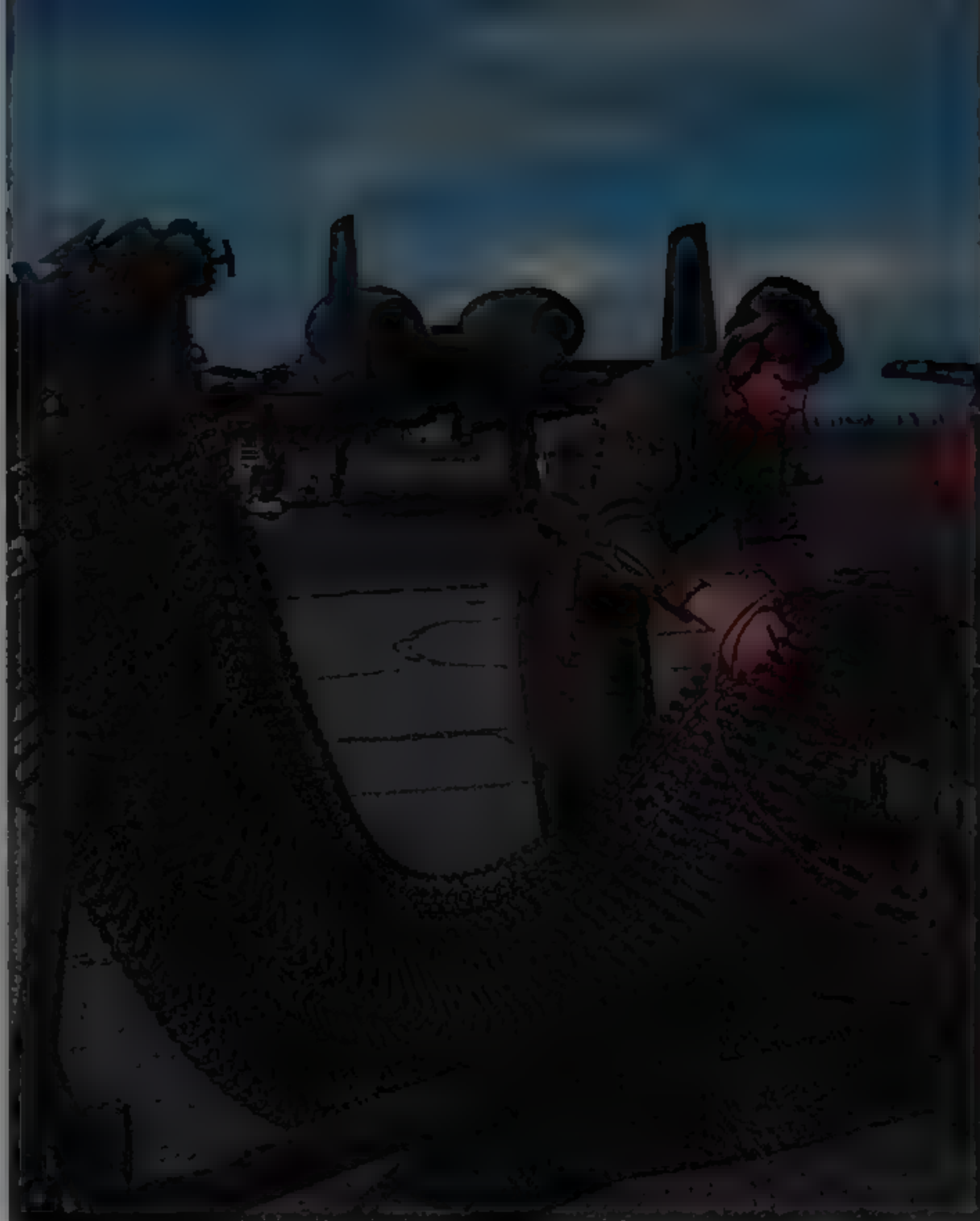
(Overleaf) Although there are some who question the ability of the A-10A to survive in a modern battlefield situation, there is no doubt that this large aircraft is very manoeuvrable, as this unusual study of a "Wart-Hog" in Europe clearly shows.







The mighty GAU-8/A Avenger 30mm cannon is a cornerstone of the A-10A Thunderbolt II's undoubted ability as a tank-buster but even such a simple act as loading it (right) requires specialised support equipment. Almost inevitably, the location of the barrel in the extreme nose has prompted the appearance of some quite fearsome artwork, exemplified below by an A-10A from the Barksdale-based Air Force Reserve outfit while below right another "Warthog" lets go a burst of 30mm shells, gases associated with firing almost engulfing the nose as it dives on its target.









Regardless of one's views on the aesthetic features of the Fairchild-Republic A-10A, the Thunderbolt II or "Warthog" is able to carry and deliver a fearsome array of ordnance. On the opposite page, munitions specialists of the 81st Tactical Fighter Wing line up a Maverick air-to-surface missile as they go about the task of installing it beneath the starboard wing of an A-10A. Similar care is evident in the study on the right which shows another weapons team with a Rockeye cluster bomb unit. Finally below, a Maverick-armed Warthog heads towards the runway at the 81st TFW's home base at RAF Béntwaters.

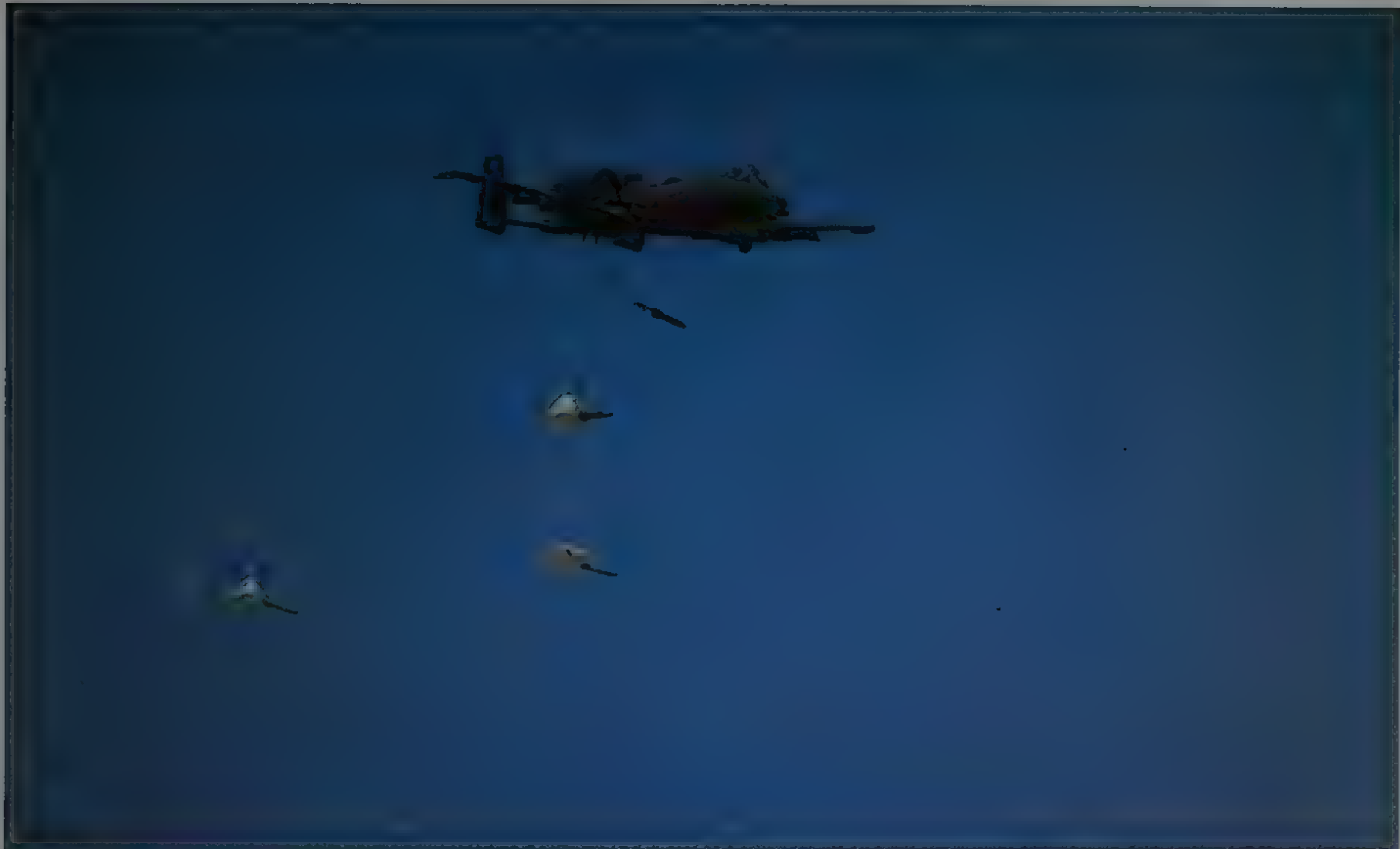






As a “bomb truck”, there are few modern warplanes that can match the ability of the A-10 Thunderbolt II. This low and slow machine is able to deliver masses of ordnance with a high degree of accuracy even though it lacks much of the sophistication of other more or less contemporary machines like the F-16. The A-10’s future is in some doubt, however, partly due to questions about its ability to survive and operate effectively in the modern high-threat air defence environment.







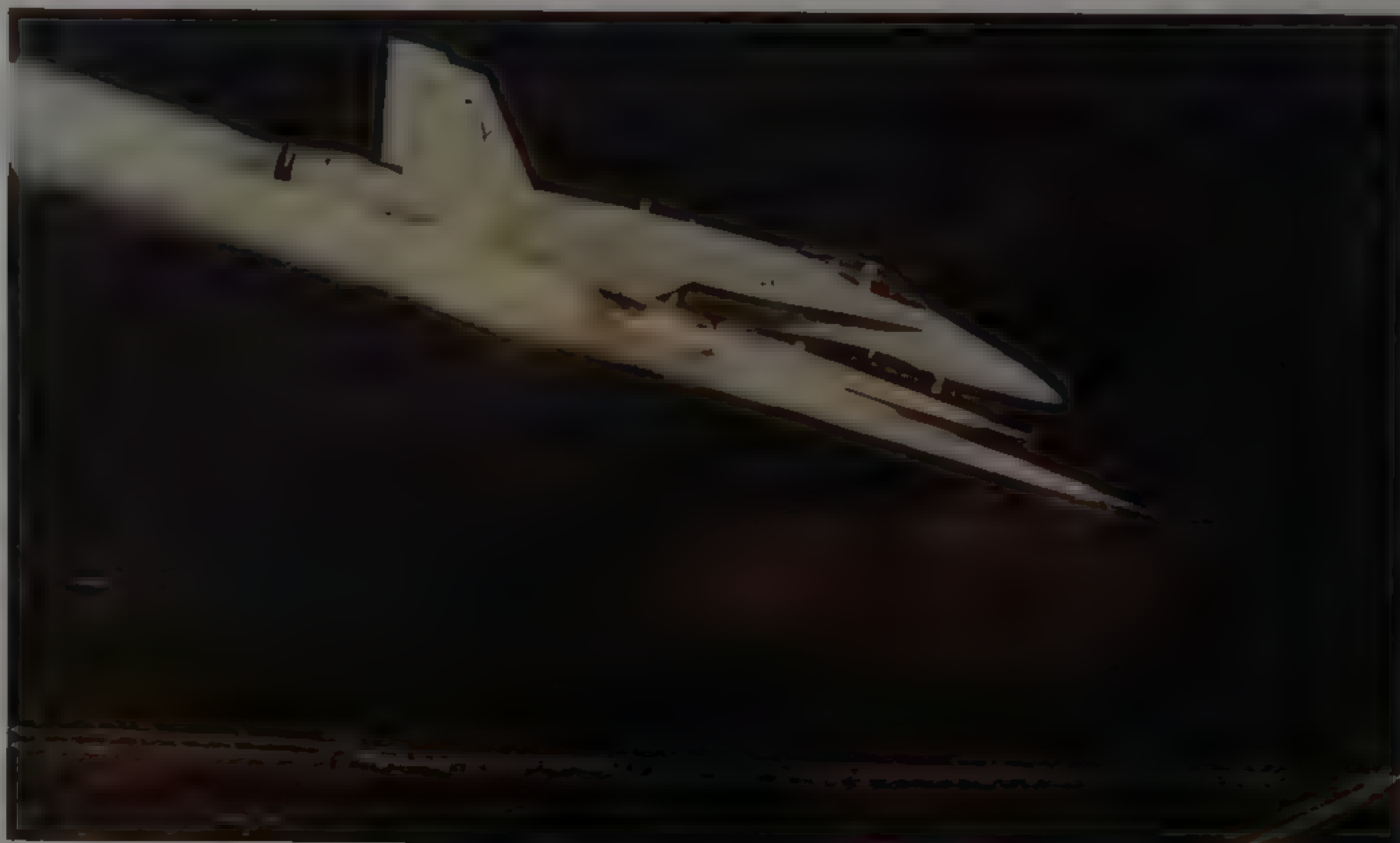




The Fighting Falcon's air-to-ground capability is also quite impressive and even conventional "iron bombs" can do an awful lot of damage if dropped with accuracy and precision as shown by a practice attack on a simulated armoured column (above).



Whichever way you look at it, the McDonnell Douglas Hornet packs a vicious sting, this being demonstrated here by a Navy example depositing two "slick" bombs (above) and a Canadian CF-18A doing its best to obliterate a target with rockets (right). On the opposite page two USMC F/A-18 Hornets of VMFA-312 are ready for almost every eventuality, with Sparrow and Sidewinder air-to-air missiles as well as AGM-88A HARMs for defence suppression and AGM-84A Harpoons for anti-shipping strike duties.







Equally adept at air-to-air and air-to-ground tasks, the McDonnell Douglas F-18 Hornet may operate with a fearsomely complex selection of weapons, including "smart" and "dumb" bombs, air-to-surface guided missiles, air-to-air missiles and even the humble rocket. When it comes to hitting the target, the aerial rocket may lack precision, but it always makes for dramatic pictures such as this one which shows a Canadian CF-18B letting fly with the contents of several underwing rocket pods.











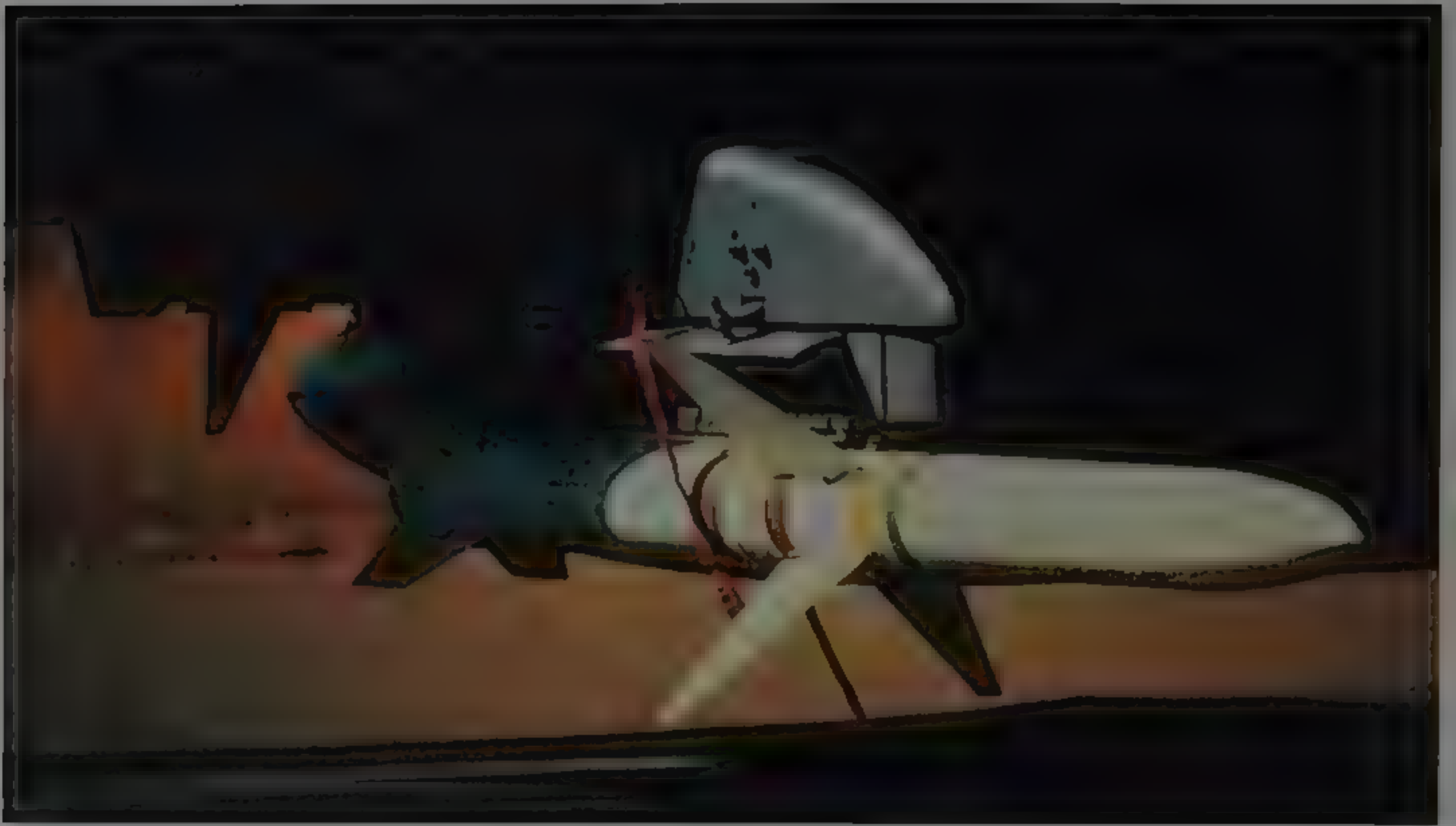
Canadian F/A-18s carry a similar range of weaponry to their US counterparts. The Sidewinder and Sparrow-armed CF-18A (top left) is displaying the "false" canopy that is painted on its undersides to confuse an adversary in air combat. Elsewhere, US Marine Corps Hornets are shown on the ground and in the air, the example above carrying a clutch of conventional "iron" bombs as well as Sidewinders.







Optimised purely for strike duties, the newest member of the Eagle family to fledge is the F-15E which forms the subject of this selection.



Suppression of an enemy's air defences is the name of the game for the "Wild Weasel" elements of the USAF and the much-modified F-4G Phantom is the basic tool, its AN/APR-38 Radar Homing and Warning System being used to identify and locate missile sites that might pose a threat. Among the weapons that can be used, the High-speed Anti-Radiation Missile or HARM (left and below on launch from an F-4G) is the newest, its accuracy being confirmed by the views at right which show a weapon of this type in the terminal homing phase of flight.









A veteran it may be, but the McDonnell Douglas Phantom is still a most capable warplane and it remains in operational service with several air arms around the world as well as with first- and second-line elements of the US Air Force. On the opposite page, an F-4G "Wild Weasel" carries a mixed ordnance load of AGM-88A HARM anti-radiation missiles and cluster bomb units as it gets ready to take on fuel from a KC-135 Stratotanker. The "Double Ugly's" conventional bombing potential is vividly depicted on this page which shows an F-4E letting go of a clutch of slick bombs against a ground target.







Forward Air Control or "FAC" aircraft are a most important facet of US Marine Corps air power doctrine, the service using the McDonnell Douglas OA-4M Skyhawk (left) as a "fast-FAC" and the Rockwell OV-10D Bronco (below) as a "slow-FAC". Both types are able to detect and mark targets for strike elements such as the AV-8B Harrier II (right) which may employ rockets or bombs in attacking an objective (bottom left).





The US Marine Corps desire to acquire a more potent version of the V/STOL Harrier was a prime motivating factor in development of the AV-8B or Harrier GR.5 as it is known by Britain's Royal Air Force. Possessing superior payload capability to the earlier AV-8A, the AV-8B is now fast replacing the veteran Skyhawk in Marine Corps light attack outfits and has given this service hitherto unknown versatility when it comes to dispersed site operations. In its latest guise, as the Night Harrier, it seems set to boost mission flexibility still further by denying an enemy the security offered by the hours of darkness.







A pair of Harrier GR5 V/STOL fighters from No.1 Squadron formate with a vivid Jindivik pilotless target (above) during a live firing exercise involving the latest version of the Harrier to enter RAF service. The target drone was eventually destroyed by a well-aimed Sidewinder (bottom right). Elsewhere, a clutch of BL755 cluster bombs are carried by a Harrier GR5 engaged on weapons separation trials (top right).





Primarily concerned with "mud moving", the Anglo-French Jaguar is able to carry a fairly respectable payload, epitomised by the No.6 Squadron example shown above with a clutch of four 1,000lb (500kg) bombs as well as Phimat chaff dispenser and Westinghouse ECM pods. It may also be used for tactical reconnaissance, the No.41 Squadron aircraft (left) carrying the bulky sensor pod on its fuselage station. Jaguar can also look after itself in an aerial battle, with the heat-seeking AIM-9 Sidewinder missile shown on the aircraft opposite being used for self-defence purposes.







Modern trainer aircraft offer an inexpensive way to acquire the means to project air power with only a modest budget. British Aerospace's Hawk is typical of this new generation, with the Series 200 version (above) being able to operate just as effectively in air-to-ground and air-to-air modes. Even the original Hawk trainer has gained teeth, as shown in the view opposite which portrays a Sidewinder-armed example of the Royal Air Force.









Synonymous with French pride and determination to achieve success in aerospace activity has been the name Mirage and three members of that family are portrayed here. In terms of destructive potential, the Mirage IV (top left) must head the list and updating of this nuclear-armed strategic variant has resulted in the Mirage IVP which carries the ASMP cruise missile. Rework of Mirage III fighters like the Brazilian example (bottom left) should ensure that they will remain active for a good few years to come while the Mirage F1CR reconnaissance model (above) seems well set for a productive career.







"Runway-busting" is just one of many air-to-ground tasks that can be accomplished by strike fighters of today and an impressively long list of weapons may be employed for this, including "dumb" and "smart" bombs as well as air-to-surface missiles. France has not been slow to develop such potential and two systems used by that nation are shown here. Opposite, examples of the Mirage III carry and drop the BAP100 which incorporates a booster rocket to ensure it penetrates the surface before detonating. Matra's Durandal is similar in that it too has a rocket booster and it forms the subject of the sequence at left, which show it being released from a Mirage III (top), the moment of booster ignition (centre) and the ensuing detonation (bottom).





The accuracy and destructive power of today's precision weapons is emphatically seen in this sequence of pictures depicting a French MATRA BGL 2000lb (1000kg) stand-off laser-guided bomb approaching and striking a reinforced concrete target during the course of weapons testing. On the pre-impact views, reference marks on the target confirm that this bomb homed with a quite remarkable degree of accuracy.









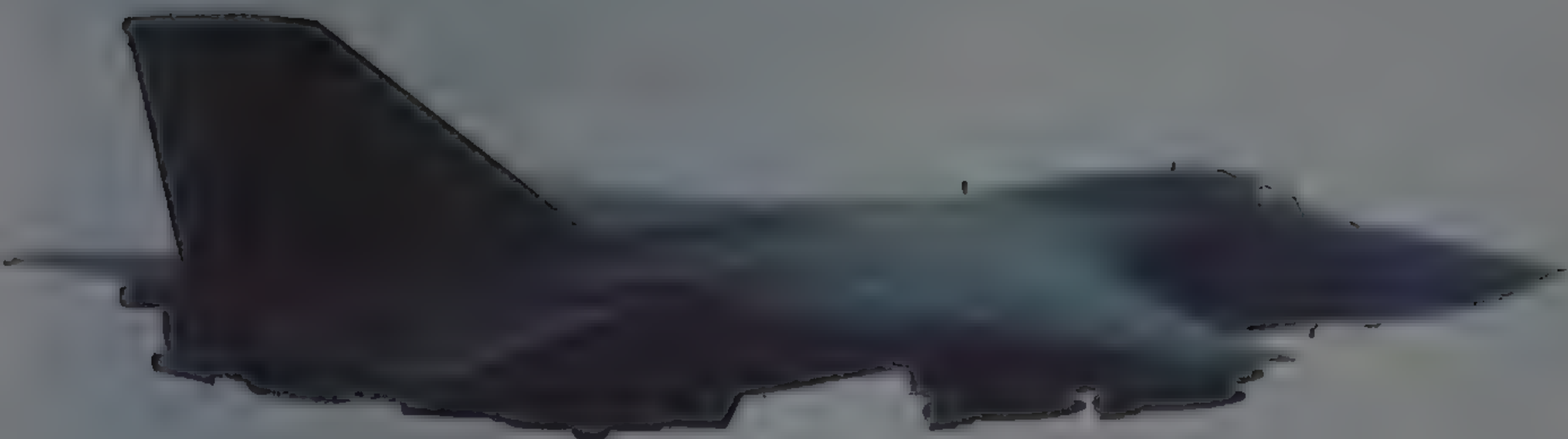
In danger of being engulfed in flame, a Mirage 2000 heads earthward as it lets fly with the contents of a battery of rocket pods stowed underwing. The basically white colour of this Mirage 2000 betrays it as being one of a handful that were used on development test tasks, unlike operational machines which wear a variety of camouflage finishes. Tests like this one are essential steps which must be taken on the road to gaining clearance for entry into service.

One of the most outstanding results of an international collaborative venture, the Panavia Tornado is now well established in service with the air arms of the three main partners, namely Italy, the United Kingdom and West Germany, with examples from the latter two shown here in varying configurations. RAF aircraft are represented by an unarmed machine from No.15 Squadron carrying Sky Shadow ECM and BOZ chaff/flare pods (right) and a No.27 Squadron example with a full array of "kit" comprising a quartet of 1,000lb bombs, fuel tanks and pods (far right). Finally, a Luftwaffe Tornado from JBG.31 (bottom) is fitted with the MW-1 sub-munitions dispenser as well as chaff/flare and ECM pods and AIM-9 Sidewinder missiles for self-defence.











With flames spewing out from its twin TF30 turbofans an F-111F gets airborne from Lakenheath at the start of a training sortie (above) while on the opposite page the damp atmosphere that is prevalent in the UK causes vapour to pour from the wings of a pair of "Aardvarks" as they begin to climb away moments after getting airborne.







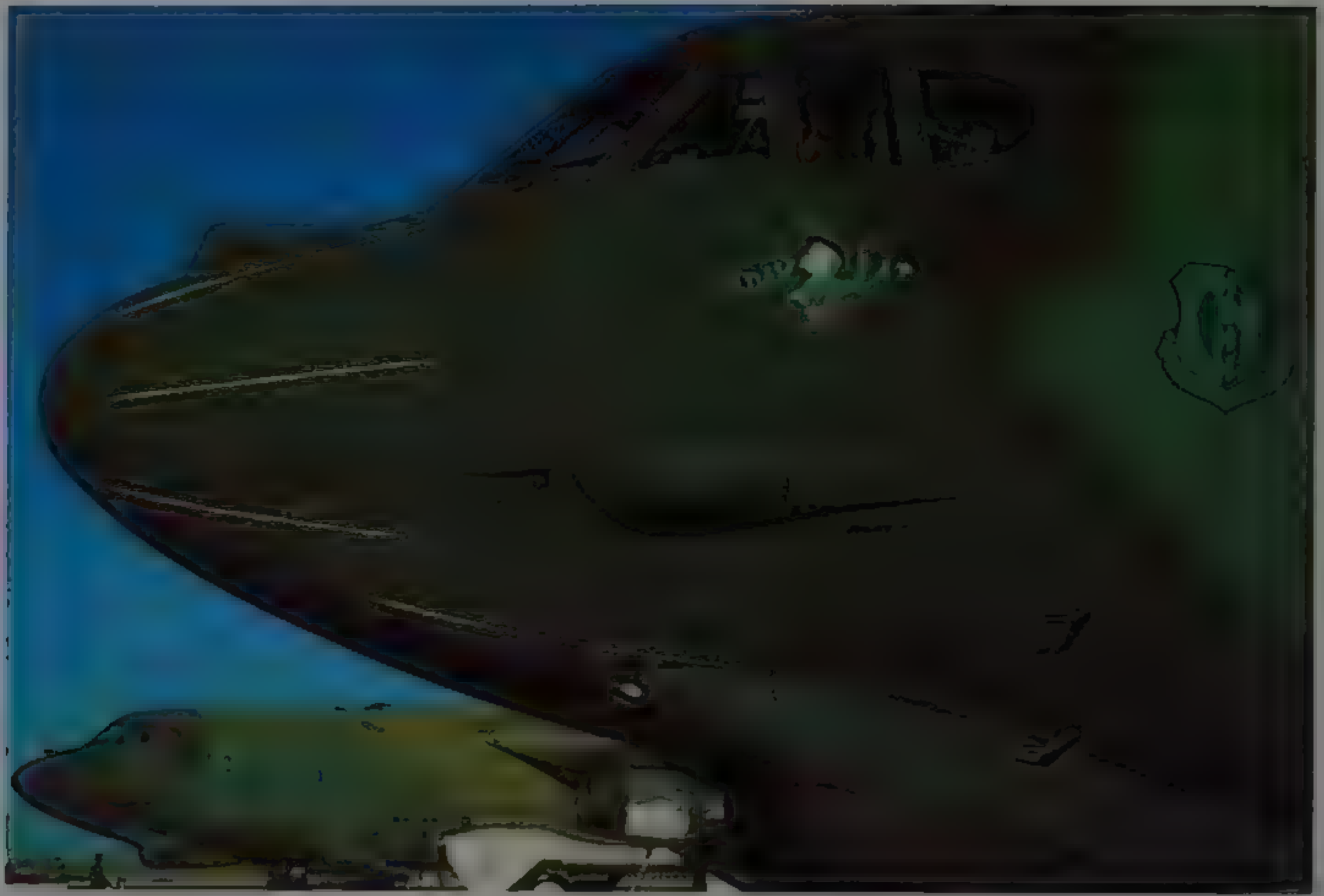
Long derided as "McNamara's Folly", the General Dynamics F-111 has come a long way since it joined Tactical Air Command back in the 1960s and it is now praised as being a very fine aircraft indeed. In US service, the long nose has led to it being known as the "Aardvark" and UK-based F-111 aircraft are portrayed here carrying and delivering a mix of retarded bombs (left) and "slicks" (above).







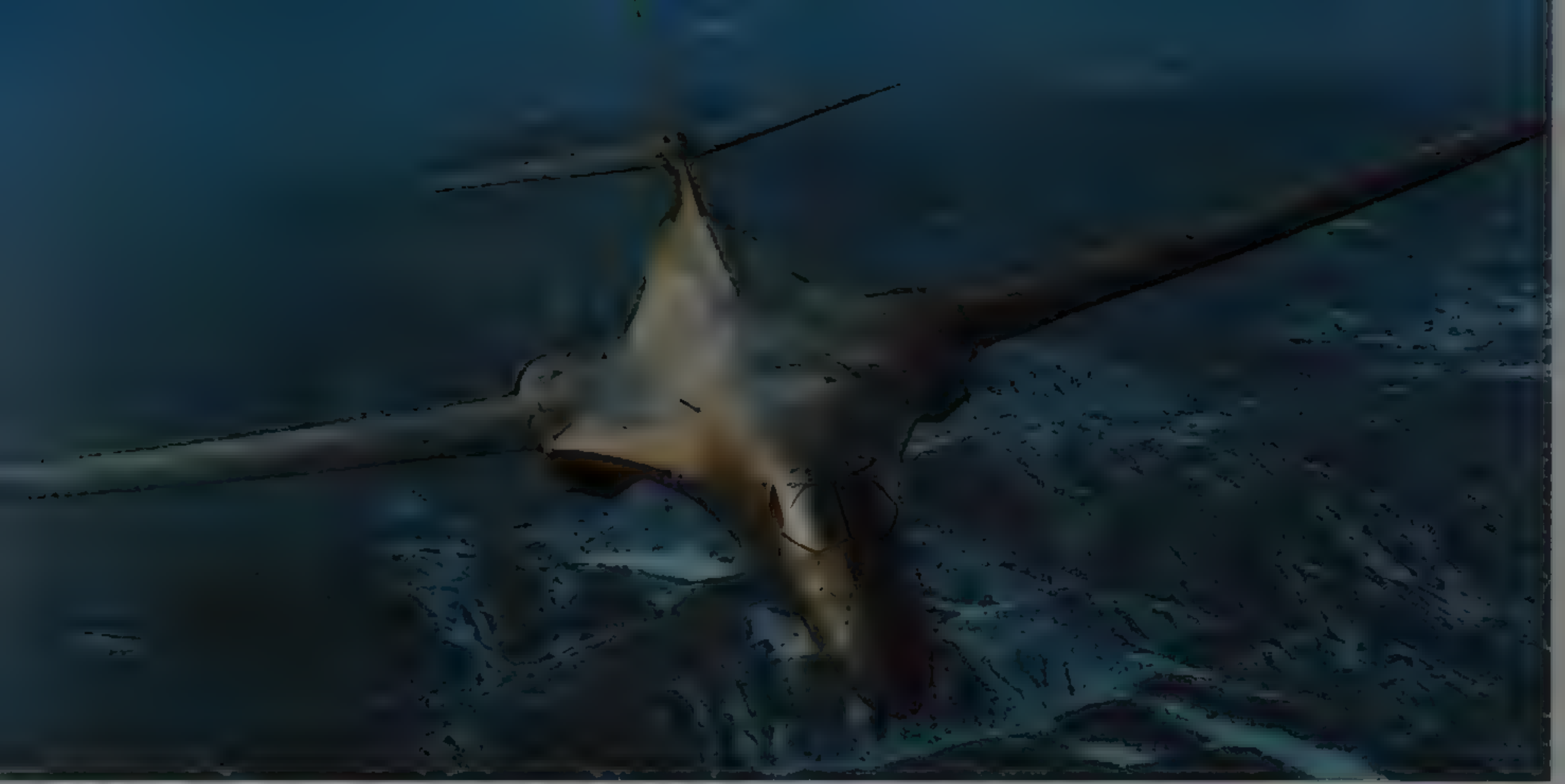
Normally associated with the strategic nuclear deterrence mission for which they would carry the Boeing AGM-69 SRAM (Short-Range Attack Missile), the General Dynamics FB-111As of Strategic Air Command are fully capable of undertaking conventional bombing tasks as shown here. After two decades of SAC service, all surviving FB-111As are now being brought to F-111G standard and are to be reassigned to Tactical Air Command for deep-strike tasks with either nuclear or conventional ordnance.



"Long in the tooth" it may be but the Boeing Stratofortress is still very much a part of Strategic Air Command. Moving clockwise from the top left, these studies depict nose art and detail of a B-52H of the 5th Bomb Wing, a 2nd Bomb Wing B-52G negotiating a bend on a taxiway, a B-52G on approach and armourers loading machine guns on a B-52G.





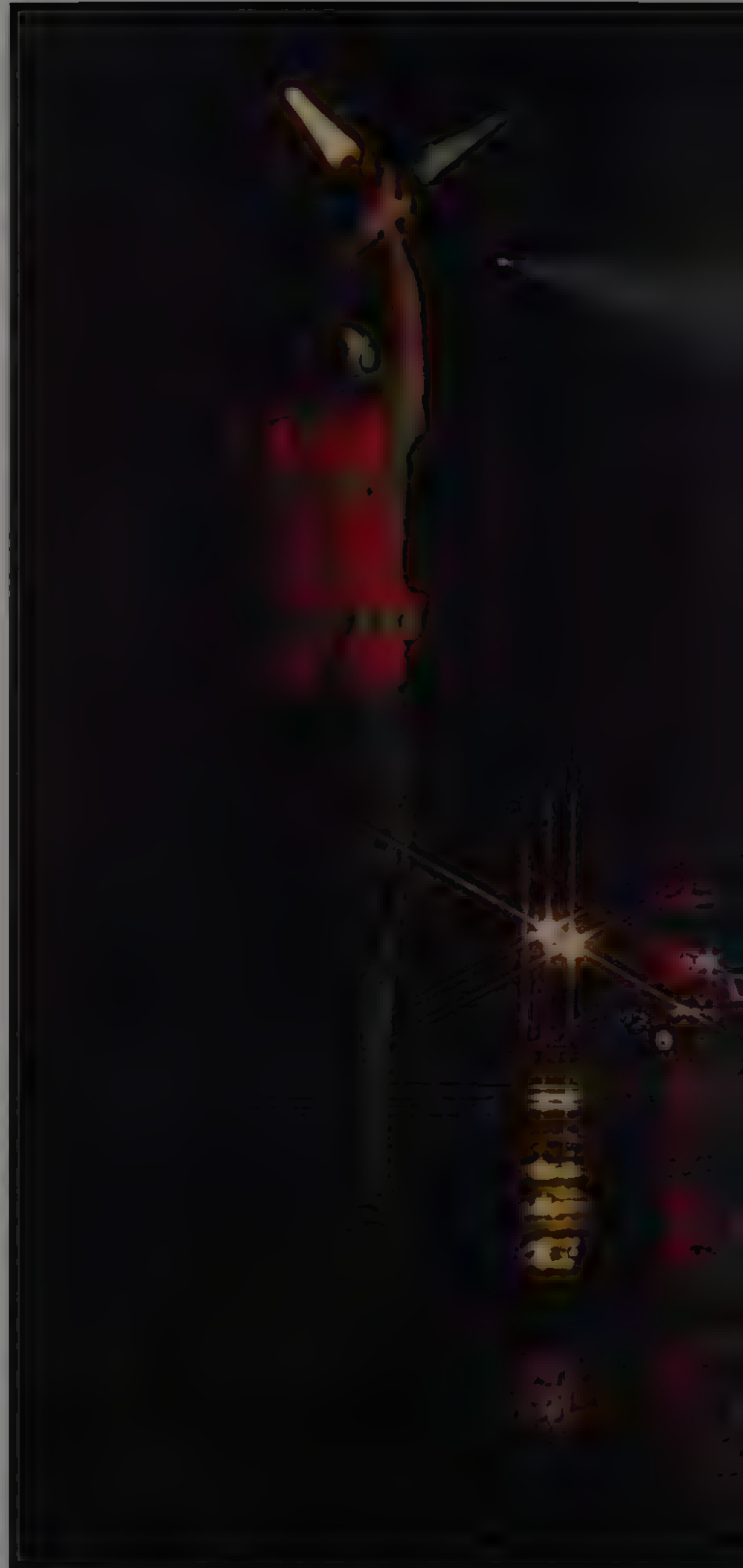


The first dedicated bomber to enter service with Strategic Air Command since the early 1960s, the B-1B is capable of using both conventional and nuclear weapons and was built to bridge the gap between the vintage B-52 and the new B-2A "stealth" bomber.





A spectre after dark! A B-1B bomber of the 28th Bomb Wing at Ellsworth, South Dakota is shown as it apparently comes to a halt under the direction of a marshaller. However, not all is as it seems, for this striking image was probably carefully posed purely for the photographer's benefit since wheel chocks are quite clearly in place against the main undercarriage units. For all that, it does convey the hulking menace of Rockwell's bomber most effectively.










More reminiscent of a "flying boomerang" than a strategic bomber, Northrop's B-2A is in the process of flight testing at present and is expected to augment SAC capability in the present decade. Opposition to the "stealth bomber" is fast mounting, however, and rising costs make it improbable that anything like the planned 132 aircraft will be built.





A high-angle, aerial photograph of a B-2A Spirit stealth bomber in flight. The aircraft is dark, almost black, and its unique flying wing shape is clearly visible. It is positioned in the upper right quadrant of the frame, angled towards the left. The background is a vast, flat, light-brown desert landscape, likely the Mojave Desert, with some faint, winding tracks or roads visible on the ground. The lighting is bright, creating a high-contrast scene between the dark aircraft and the light ground.

The shape of the future or a look back to the past? Seen flying high over California's Mojave desert, the B-2A looks futuristic indeed but those with long memories may recall that this is by no means the first attempt by Northrop to design and produce a "flying wing" bomber for the USAF. In the early 1940s, the B-35 and B-49 also entered flight test but both eventually fell foul of cancellation, a fate that some are now seeking for the "stealth bomber". Horrendous expense is largely to blame, but its appearance at a time when superpower relationships are warmer than for decades has persuaded many to argue that it isn't really needed at all. All of this bodes ill for Northrop's future as an aircraft manufacturer and the B-2A may well prove to be the final nail in the company's coffin. For now, though, it survives and there can be few who would deny that it is a most bizarre and spectacular looking machine, as well as a peculiarly graceful one.





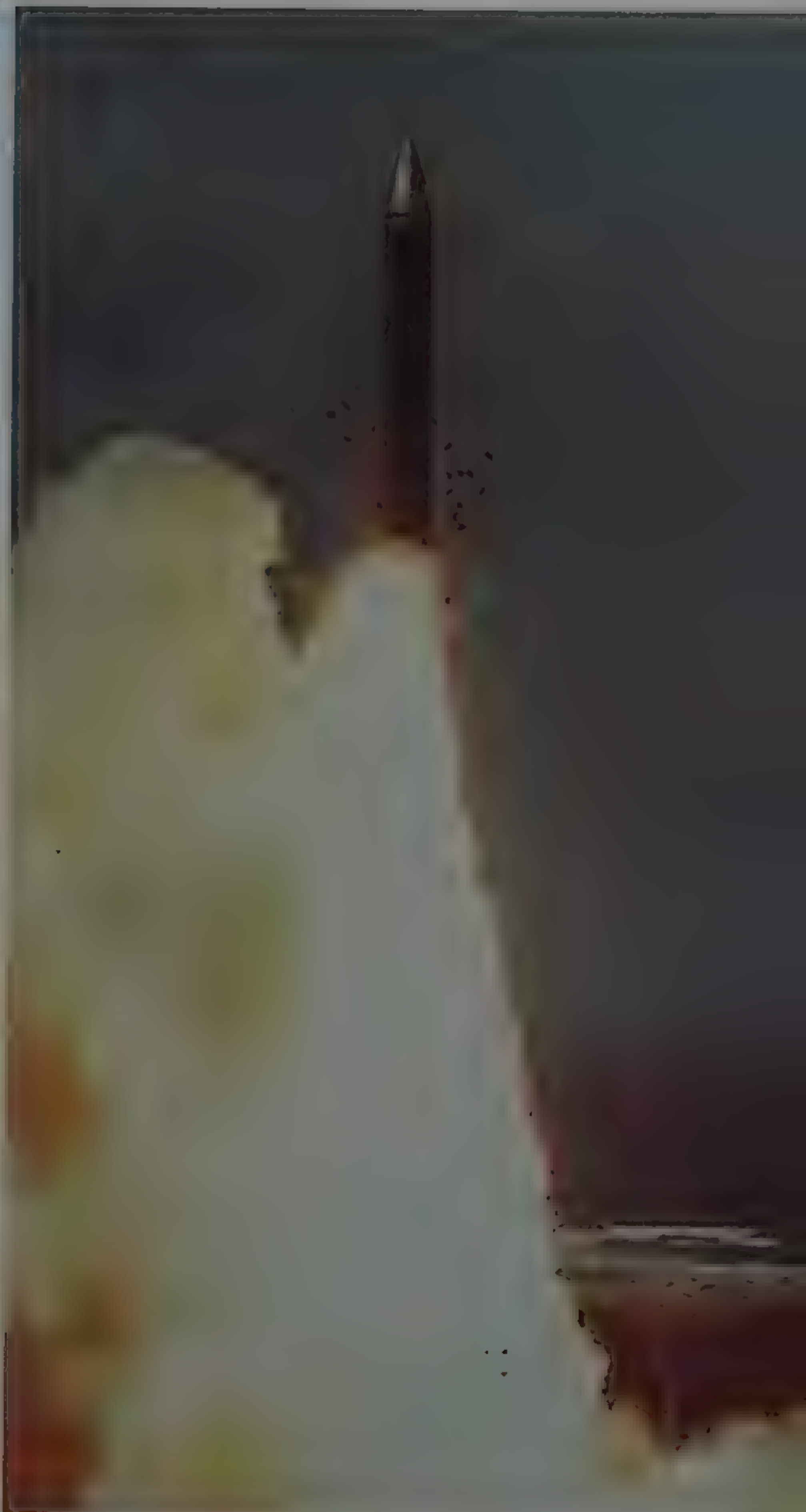
At the top end of the scale in terms of sheer destructive power is the Intercontinental Ballistic Missile. Boeing's LGM-30G Minuteman III is a typical example and Strategic Air Command has several hundred missiles of this kind, these being emplaced in concrete silos (above). A Minuteman roars upwards from the test site at Vandenberg while six Mk.12 re-entry vehicles from two LGM-30Gs trace a fiery passage through the night sky as they impact near Kwajalein Atoll.







The sequence of pictures below show a MGM-118A Peacekeeper test missile emerging from its silo at Vandenberg, California at the start of a several-thousand mile flight on the Pacific Missile Range while the view at far left depicts technicians working on a "bus" containing several warheads, each of which can be independently programmed to hit a specific target.







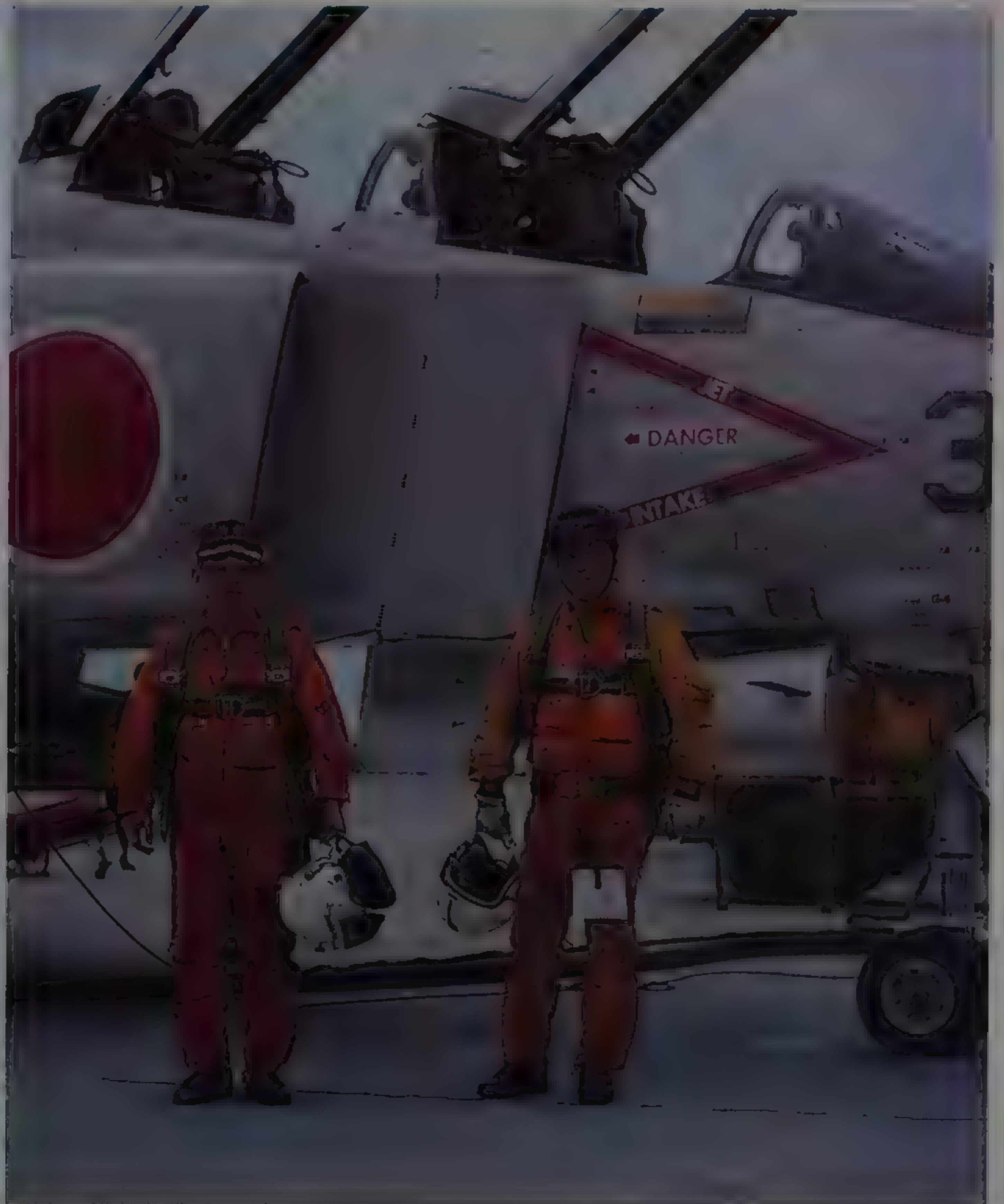
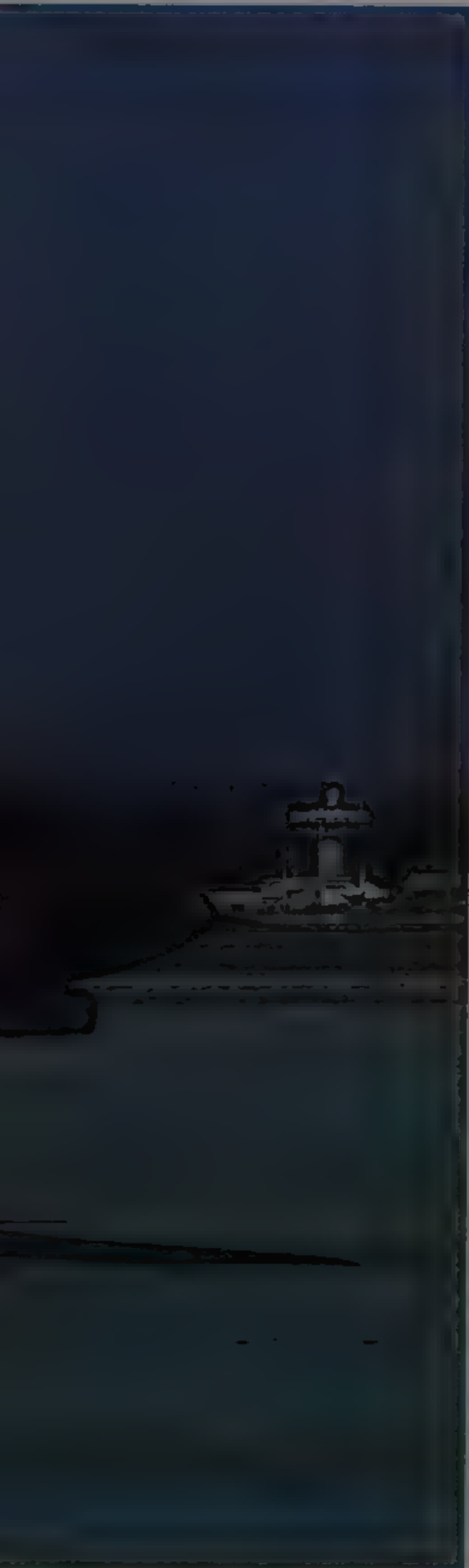
Licence-built examples of the Sidewinder and Sky Flash air-to-air missiles are carried by a JA37 Viggen interceptor (above and bottom right) from F13 Wing at Norrköping. Known in Sweden as the RB24 and the RB71 respectively, the green colour of the missiles almost certainly indicates that they are inert rounds. Finished in the recently adopted overall grey colour scheme, this JA37 is one of 149 in service but Sweden's Flygvapnet also has a number of other variants, including the AJ37 all-weather attack version and the SH37 for naval attack and surveillance. Carrying a test RBS15 anti-ship missile, an AJ37 forms the subject of the last view (top right) in the original splinter-style camouflage.



The Air Self-Defence Force of Japan has been a customer for US-designed hardware for many years and currently features two famous McDonnell Douglas warplanes in its inventory, both of which have been built locally under the terms of a licence agreement. Below can be seen an F-4EJ Phantom in No.304 Squadron insignia with the picture at right showing an F-15J getting airborne. At bottom right, a "two-star" general of the JASDF is shown in full flight kit prior to setting off for a training sortie in which he will act as navigator.









The Israeli Defence Force/Air Force has few equals in the Middle East and has done much to develop indigenous weapons such as the heat-seeking Python, shown above on an F-16 and a Kfir. The two views at right depict bomb-laden IDF/AF examples of both types of warplane.

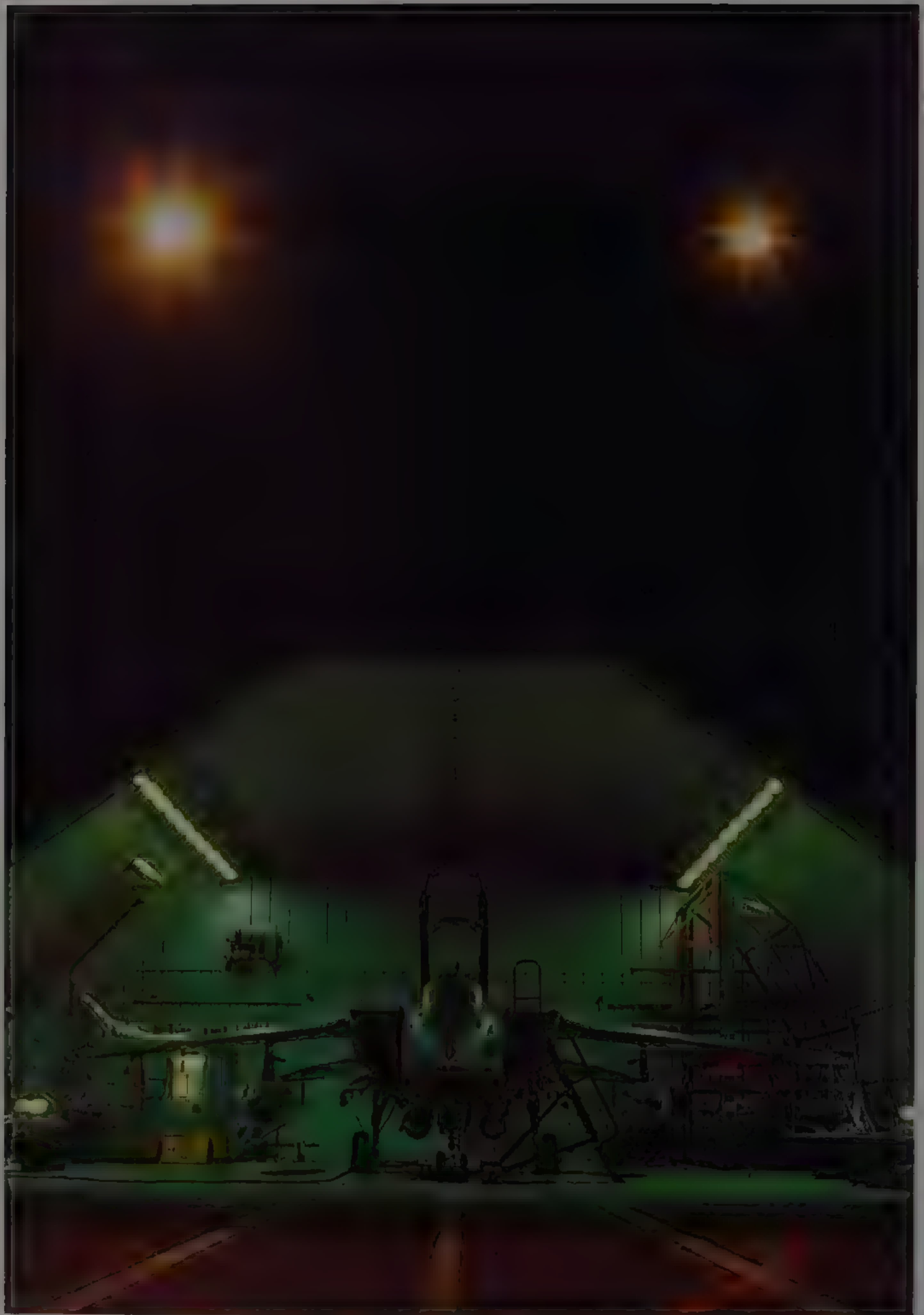








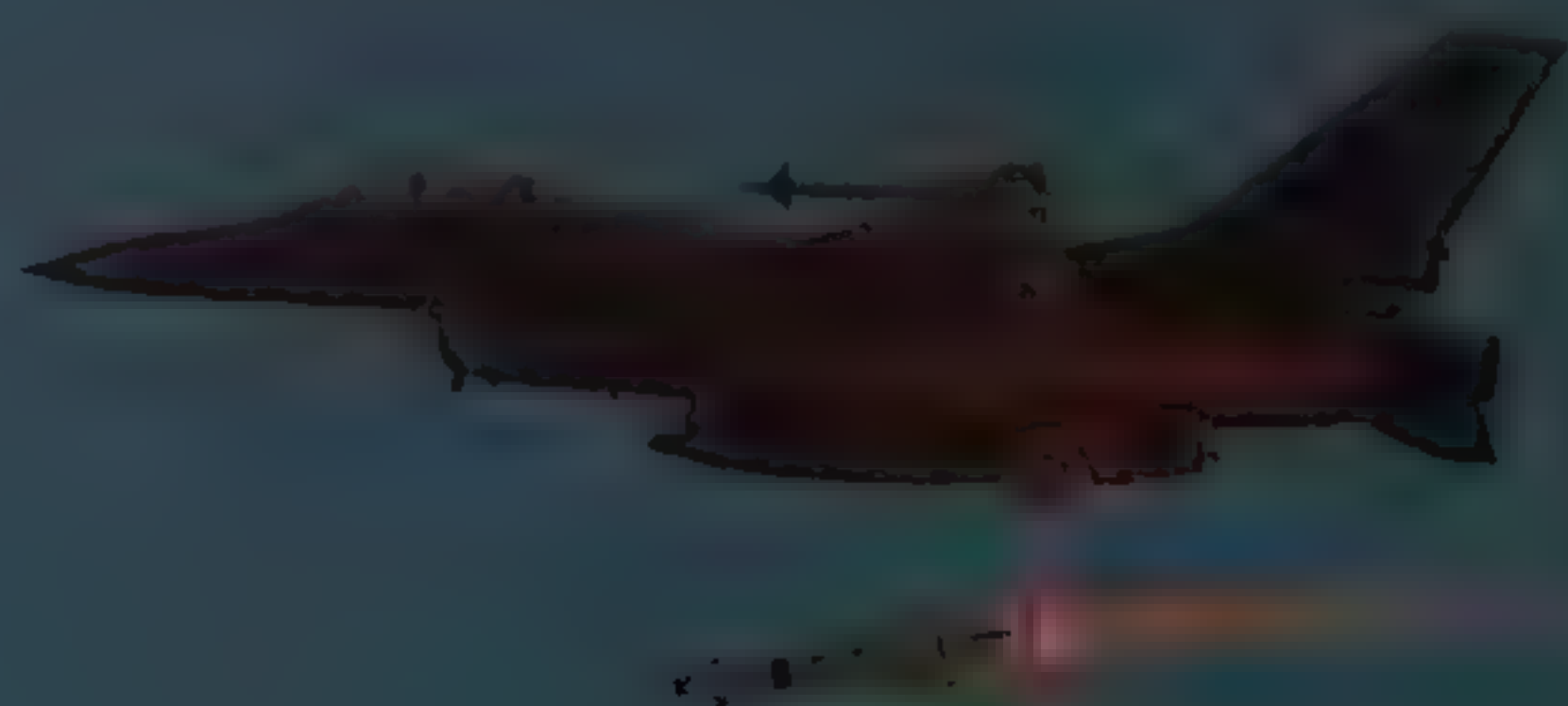
Scarcely known by the general public before the 1982 Falklands War, the AM.39 Exocet sea-skimming anti-ship missile is now possibly one of the best known missiles in the world, even though it may not necessarily be the most capable in its class. In service with many countries it can be carried by small fighter and attack aircraft such as these Dassault-Breguet Mirages. Once the missile is launched (above) it skims a few feet above the waves towards the last known target position before switching on its own radar for the terminal attack phase.



A Bruggen-based Tornado GR.1 of the RAF lurks in its well-protected hide before leaving for a night mission (above) while the type's maritime attack potential is portrayed by a Marineflieger machine at low level over the sea and an Italian example carrying two radar-guided Kormoran "sea-skimming" anti-shipping attack missiles.









Following the development of ship-launched versions, the Norwegian Penguin anti-ship missile has taken to the sky in the form of the Mk.3 which is optimised for carriage by the General Dynamics F-16 Fighting Falcons of the Royal Norwegian Air Force. Shown in the course of tests conducted in the USA, it has a range in excess of 25m (40km) and relies on an infra-red seeker for terminal guidance.

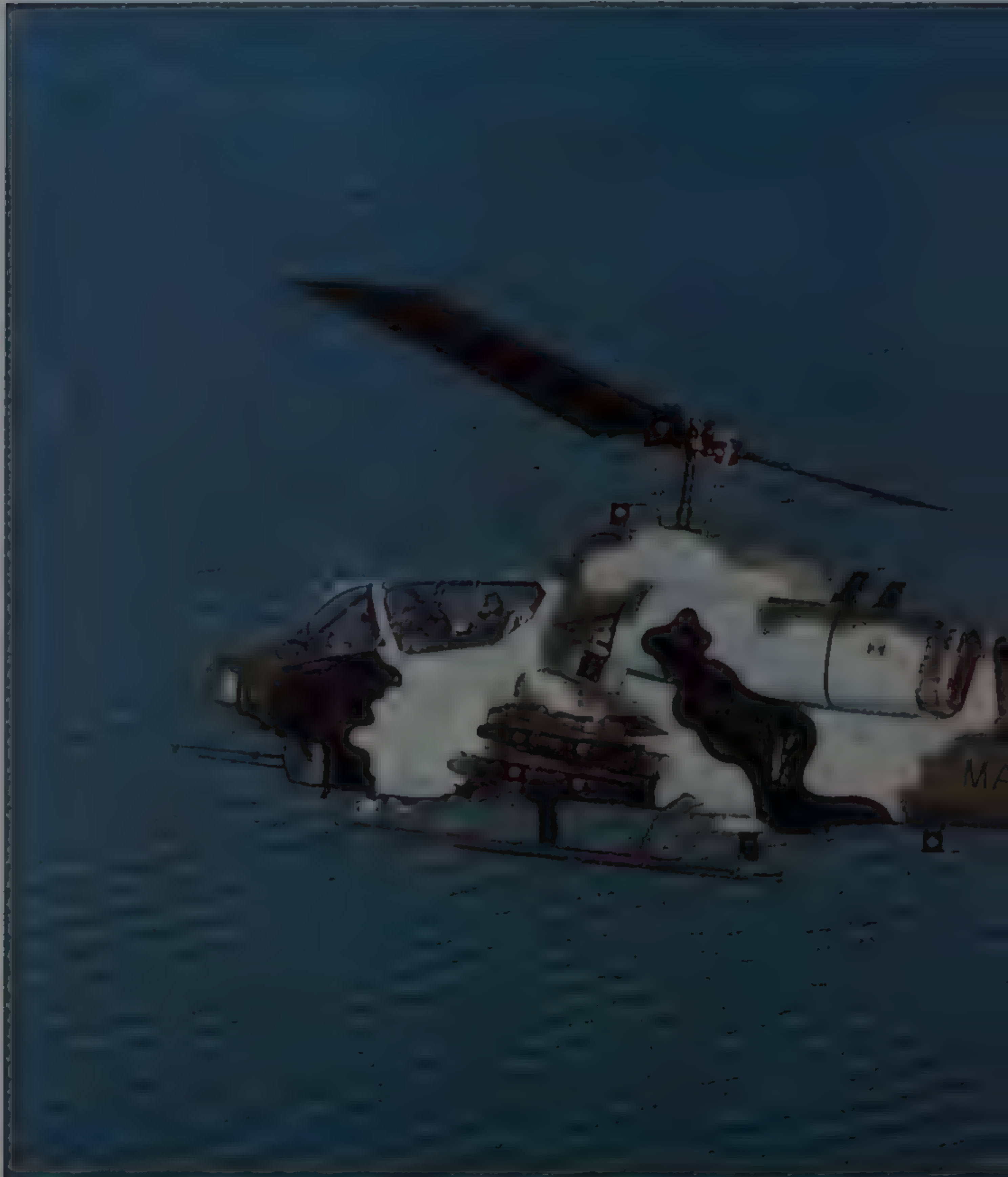




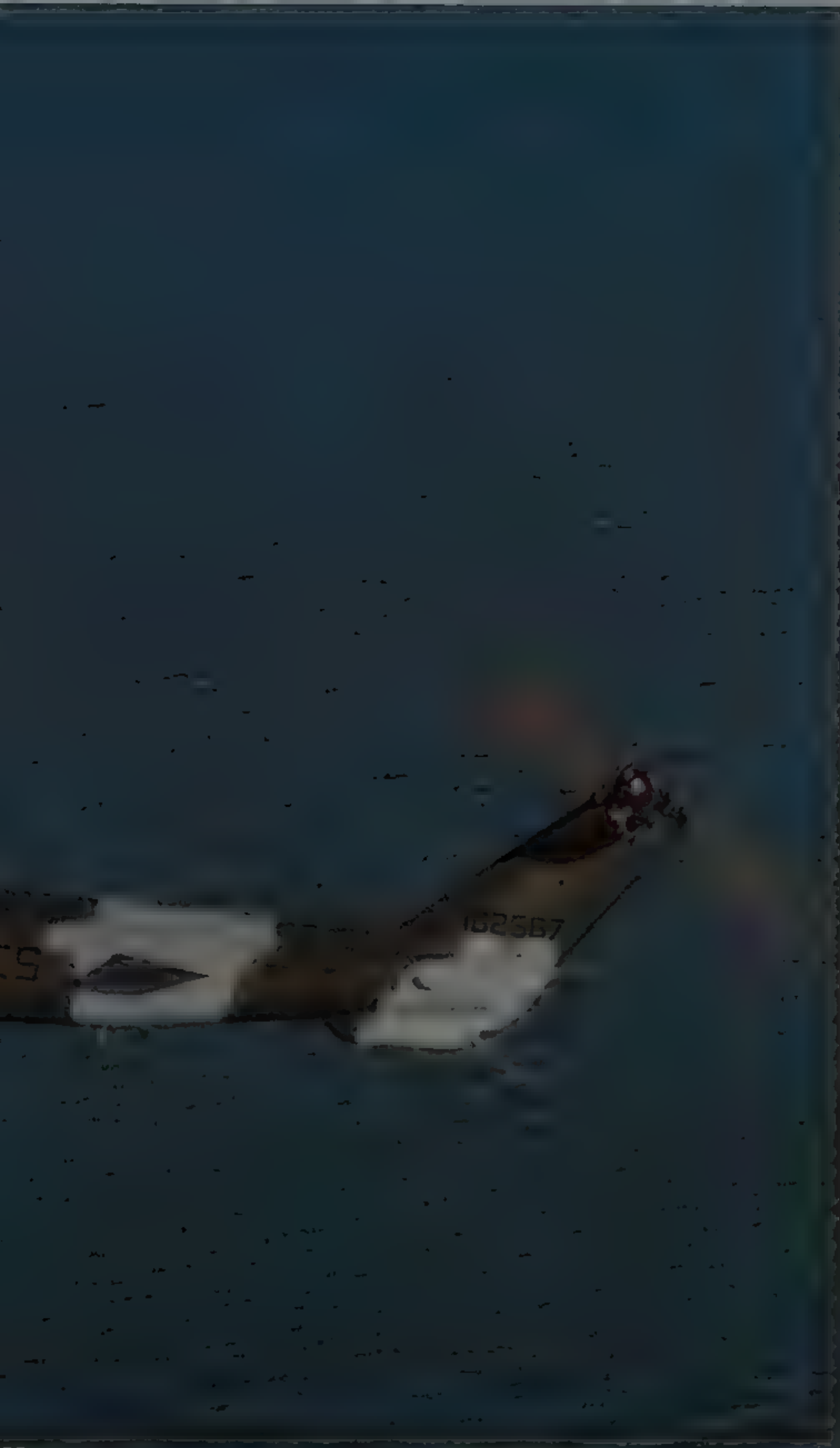
Combat-proven during the long and bloody Vietnam War, the Bell HueyCobra has since been transformed beyond almost all recognition, acquiring new weapons, sensors and missions in the process. Once a mere support gunship, the addition of the Hughes TOW missile has given it a fearsome anti- armour capability. HueyCobras portrayed here are typical of the US Army fleet and carry a mixture of rocket pods, TOW missile launchers and the standard 20mm gun as well as features intended to enhance survivability such as flat plate canopies, revised engine exhaust nozzles and IR countermeasures gear.









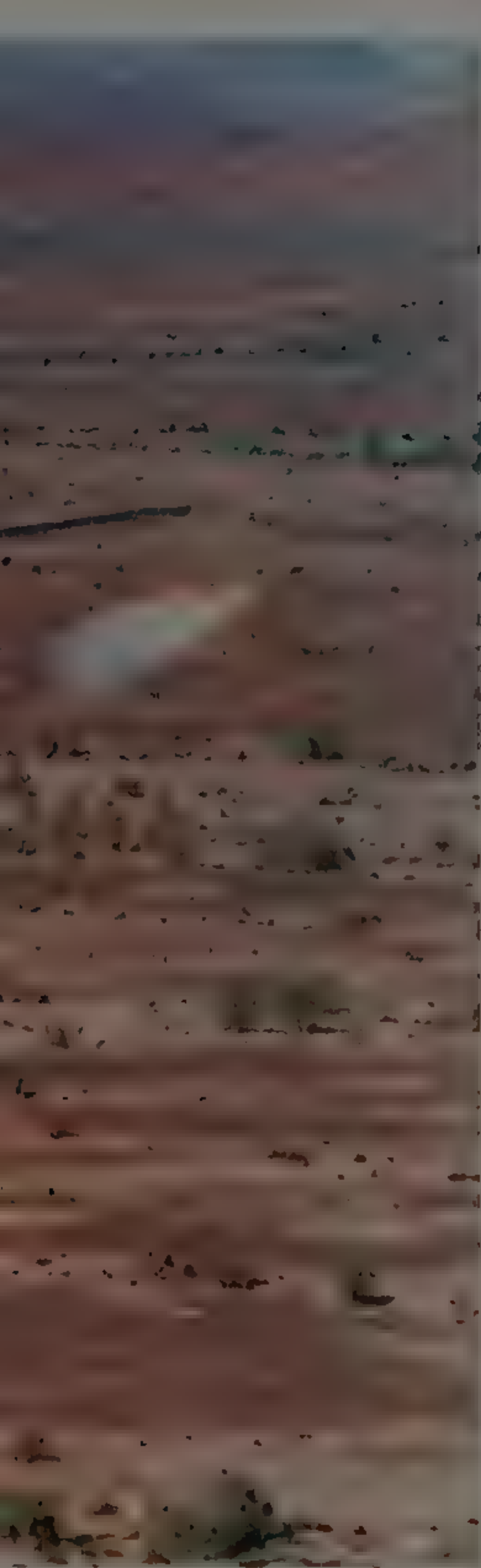


Beginning life as a fairly simple armed helicopter for escort and fire suppression duties, the Bell HueyCobra has been transformed almost beyond recognition, gaining new missions and armament on the way. Without doubt the most potent variation of this combat veteran is the AH-1W of the Marine Corps, service examples being seen here in action over the sea and over desert terrain while a dayglo-daubed test-bed fires a Sidewinder IR-homing air-to-air missile. Other weapons which may be used include TOW and Hellfire anti-tank missiles, unguided rockets and the nose-mounted 30mm cannon.









When it comes to "clout", few helicopters can compare with the McDonnell Douglas AH-64A Apache in terms of armament and all-weather capability. Compatible with an impressive array of weaponry, including the Hellfire air-to-surface, the Sidarm anti-radiation and both the Sidewinder and Stinger air-to-air missiles, it is now well established in service with US Army elements at home and in Europe. This spread portrays Apache facets which include firing an unguided rocket (top left), night and day flying (bottom left and right) and the laser guided Hellfire which is the primary tank-killing armament (top right).







Undoubtedly the most lethal example of the gunship genre as well as one of the most unattractive helicopters that is currently flying anywhere in the world, the McDonnell Douglas AH- 64A Apache is well established in service with US Army combat elements at home and abroad. European-based machines are depicted here in a set of photographs which offer impressive proof of Apache firepower. Armament options embrace Hellfire air- to-surface and Stinger air-to- air missiles, a 30mm M230 Chain Gun and 2.75in unguided rockets.



While not necessarily able to "mix it" in traditional forms of air-to-air combat, modern gunship helicopters such as the McDonnell Douglas AH-64A Apache are gaining means and methods of countering threats posed by conventional fighter aircraft. Among the air-to-air weapons which may now be carried and fired by some US gunship helicopter types is the AIM-9 Sidewinder and an example of this potent missile is seen accelerating away from an AH-64A engaged on weapons development work in the USA.









Entering service with the US Army back in the late 1960s, the Bell OH-58 Kiowa scout helicopter has been a vital adjunct to the more potent HueyCobra and Apache even though it originally lacked armament of its own. Now, under the AHIP (Army Helicopter Improvement Program), that oversight is being eliminated with US Army Kiowas taking on a far more lethal role as they are given sighting devices and armament. Known as the OH-58D, the new Kiowa variant is better able to perform scout tasks and can carry the full gamut of rockets, gun pods and missiles.



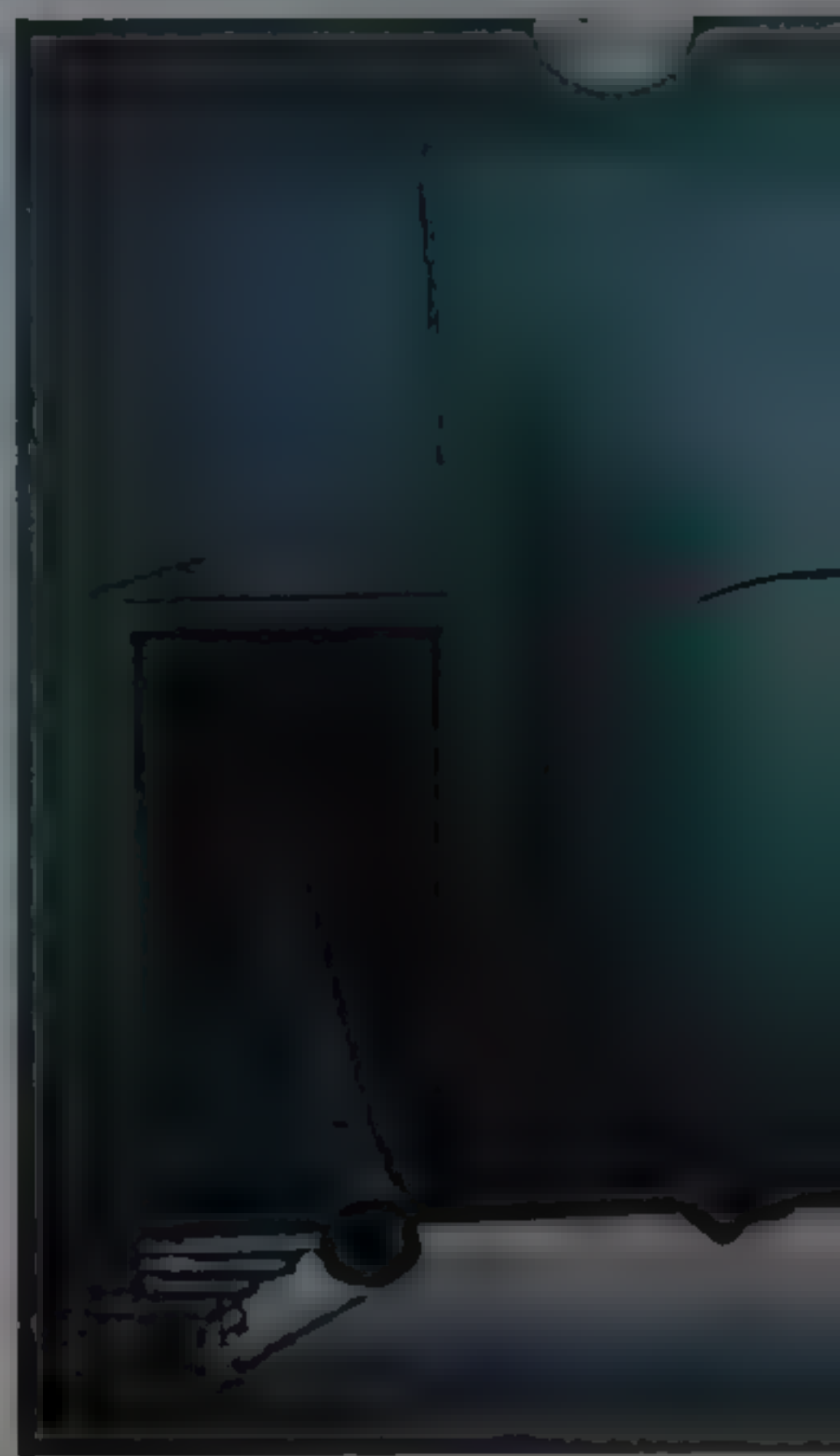


Sweden's Army is one export client, for the MBB Bo.105, obtaining 20 HeliTOW equipped machines (above) for the anti-tank task, each of which can carry a battery of four missiles. The major user is West Germany which has over 300, including a large number of the PAH-1 variant (opposite). The Euromissile HOT is the principal weapon and up to six may be carried. Improvement efforts will lead to Heeresflieger PAH-1s being updated from 1990 with HOT-2 and the roof-mounted night-vision system shown installed on a test aircraft (right).

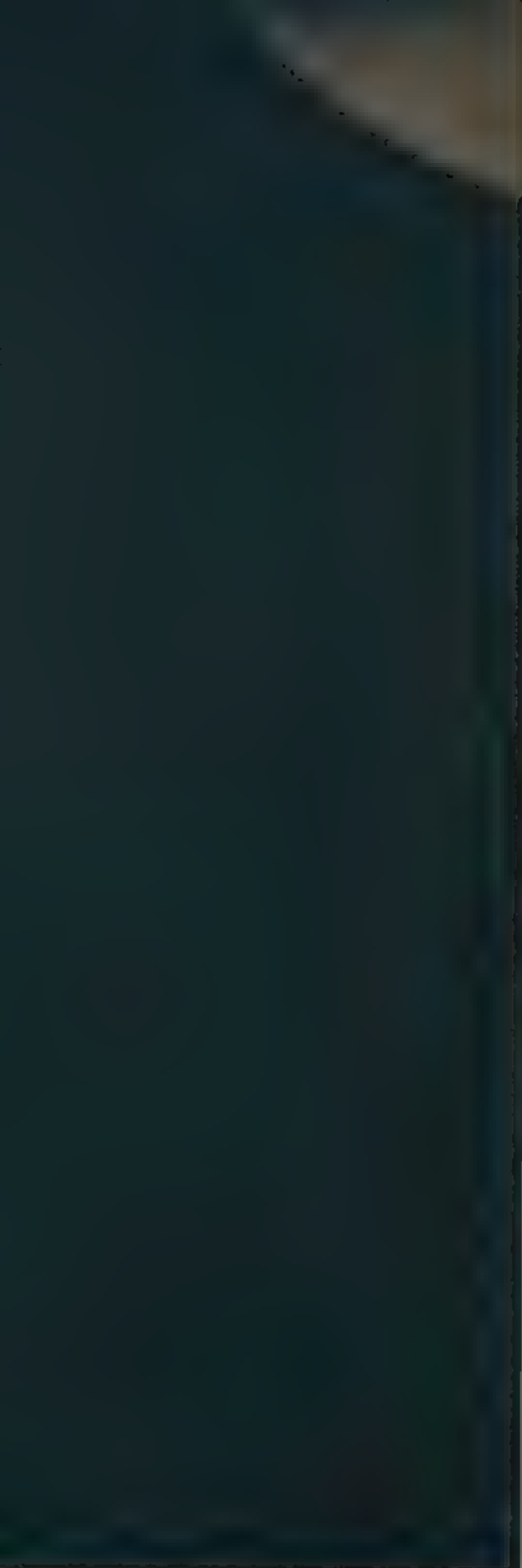












The inscription on the nose of the Hercules above reveals it to be the first production example of the long-serving and versatile "trash hauler", but it now has a rather more warlike role as an AC-130A "Spectre" gunship. Weapons fit varies according to individual model, but the Vulcan M-61A1 20mm cannon is a standard item on both AC-130A and AC-130H. The latter also possesses a 105mm howitzer which replaces one of two Bofors 40mm cannon installed in firing ports aft of the wing (left).







When it comes to flying and maintaining the contemporary warplane, personnel may have to don special clothing and other items of kit in order to perform their duties. In a chemical warfare environment, for example, ground support technicians will be forced to wear cumbersome "noddie suits" (opposite). Designed to ensure survival, these uncomfortable garments are estimated to cut efficiency by as much as 60 per cent. Even more bizarre are the night-vision goggles as worn by an AV-8B Harrier II pilot (bottom left) while even a standard "bone-dome" and face mask modelled by an F/A-18 pilot (left) can appear quite futuristic.









For all the sophistication of the contemporary warplane, it is still the man in the cockpit who is ultimately responsible for the success or failure of a mission. The process of preparation begins long before the pilot heads for the flight line for there are many planning activities to be dealt with. Only when they are completed does the pilot move to his aircraft, subjecting it to a detailed pre-flight inspection such as that being done on an F-16 of the 388th Tactical Fighter Wing at Hill AFB, Utah (far left bottom). With pre-flight over, it's time to occupy the cockpit, an F-4G driver being seen as he prepares to make the short climb (left). Once in place, a few minutes are devoted to strapping in and there are still more checks to be done before initiating the engine start procedure, often with the aid of a hand signal demonstrated by the pilot of an A-10A Thunderbolt II (far left top).

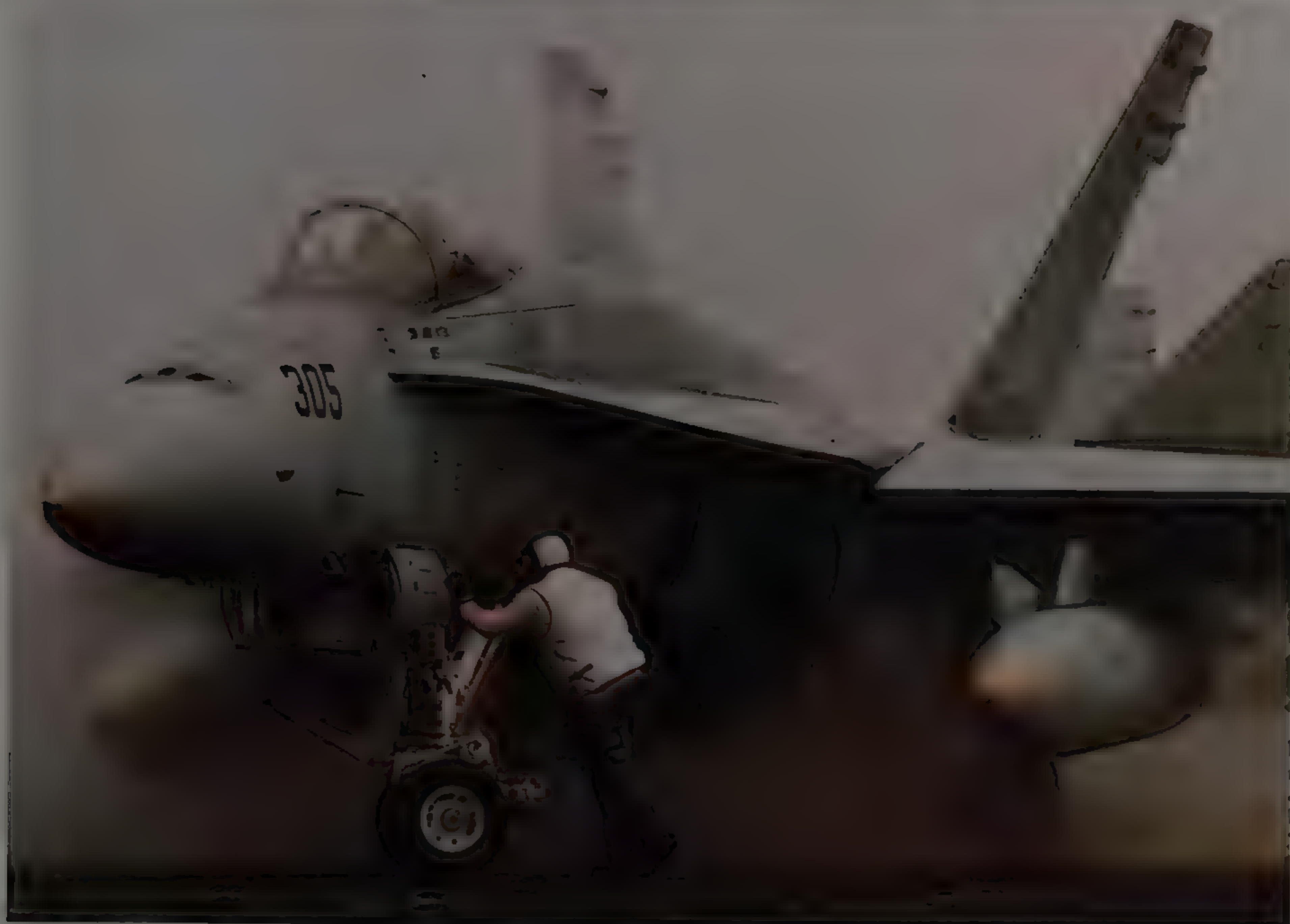






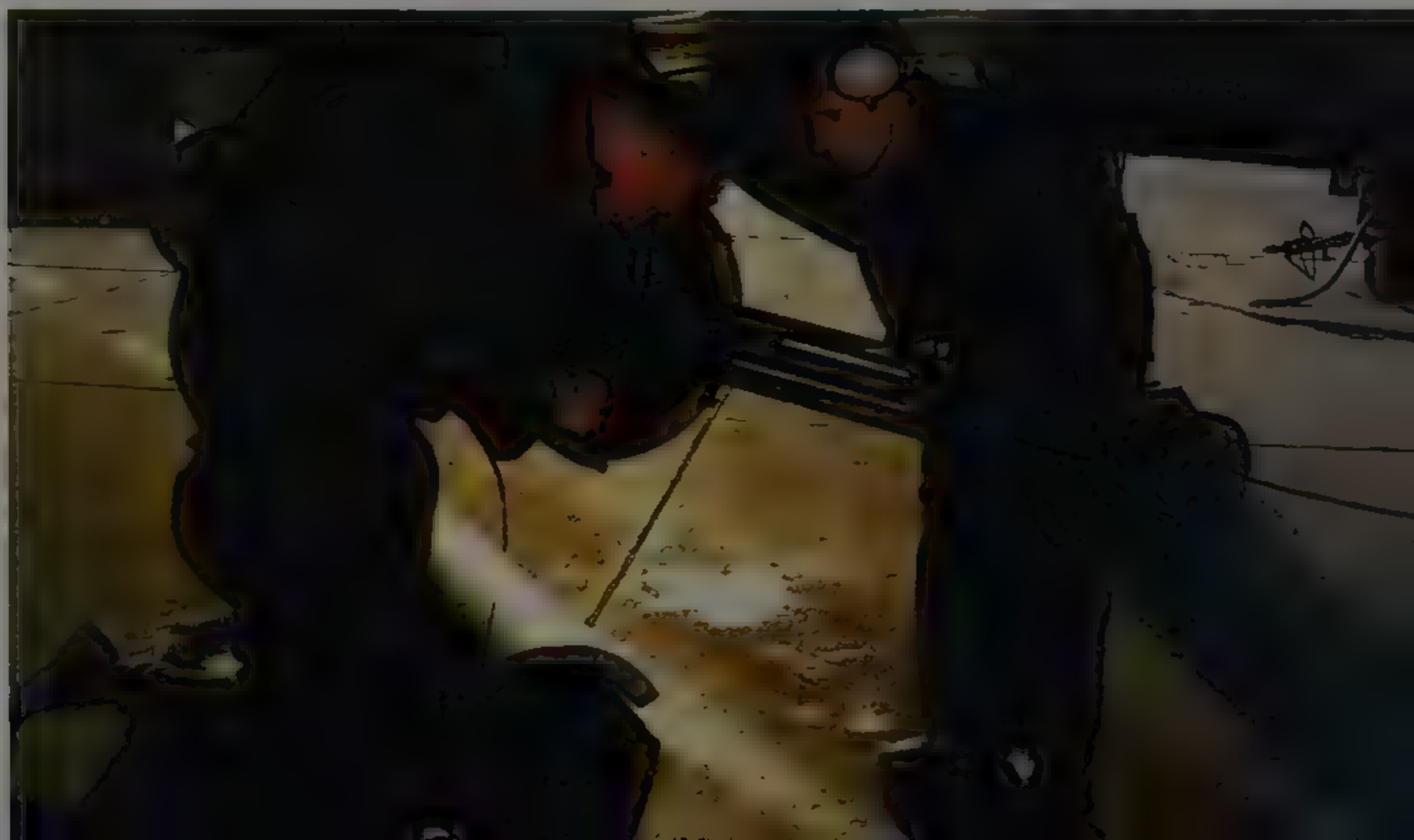


To the outsider, the cockpit of a modern warplane is quite bewildering but modern display technology has led to a much simplified layout and a less rigorous workload. The “front office” of an F/A-18C Hornet (far left) is typical of many contemporary cockpits in that it is dominated by visual display unit screens which can present a wealth of data to the Hornet pilot (left) as, guided by a member of the carrier deck crew, he steers his aircraft through the crowded confines of the flight deck towards one of the USS Constellation’s four steam-powered catapults.

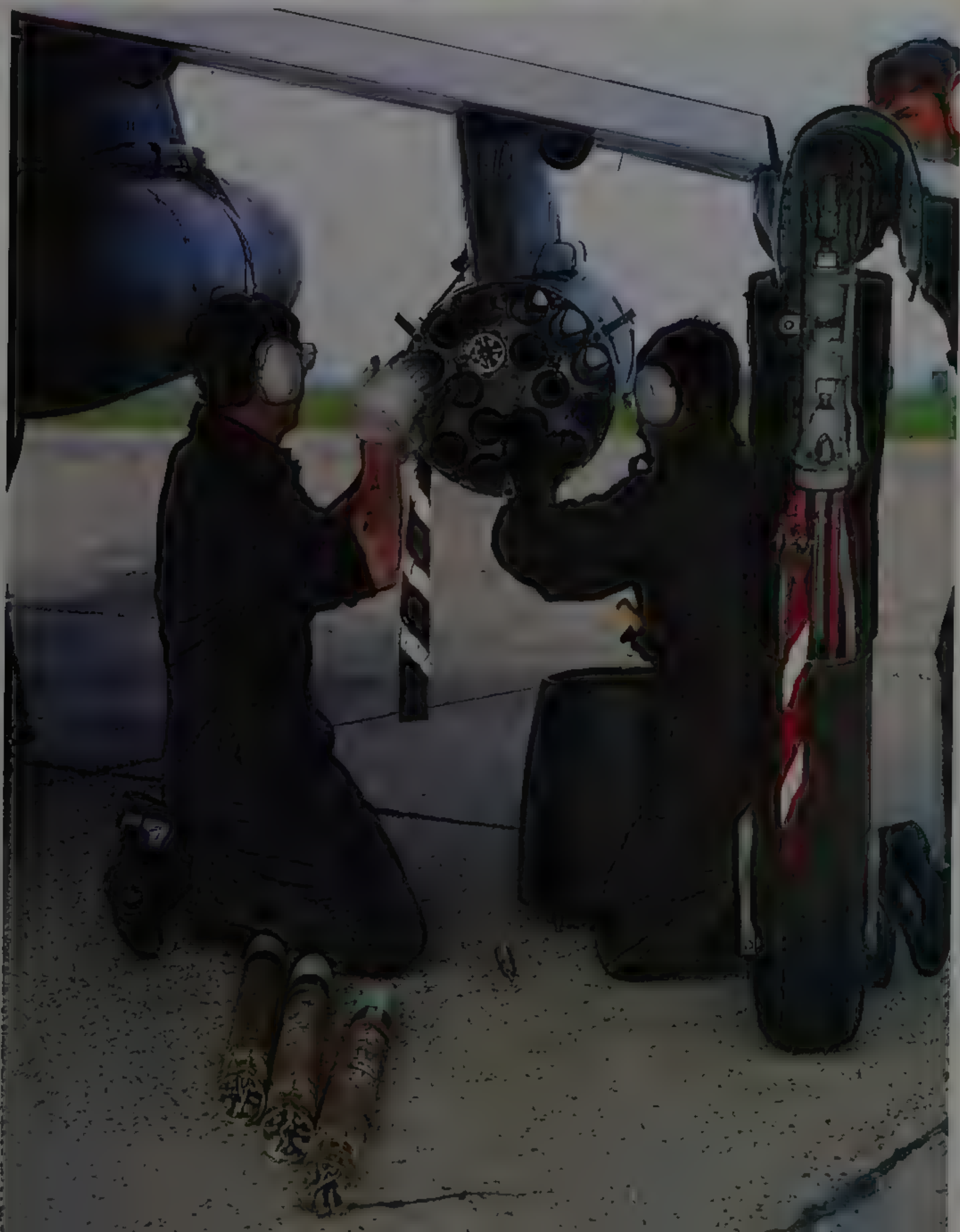
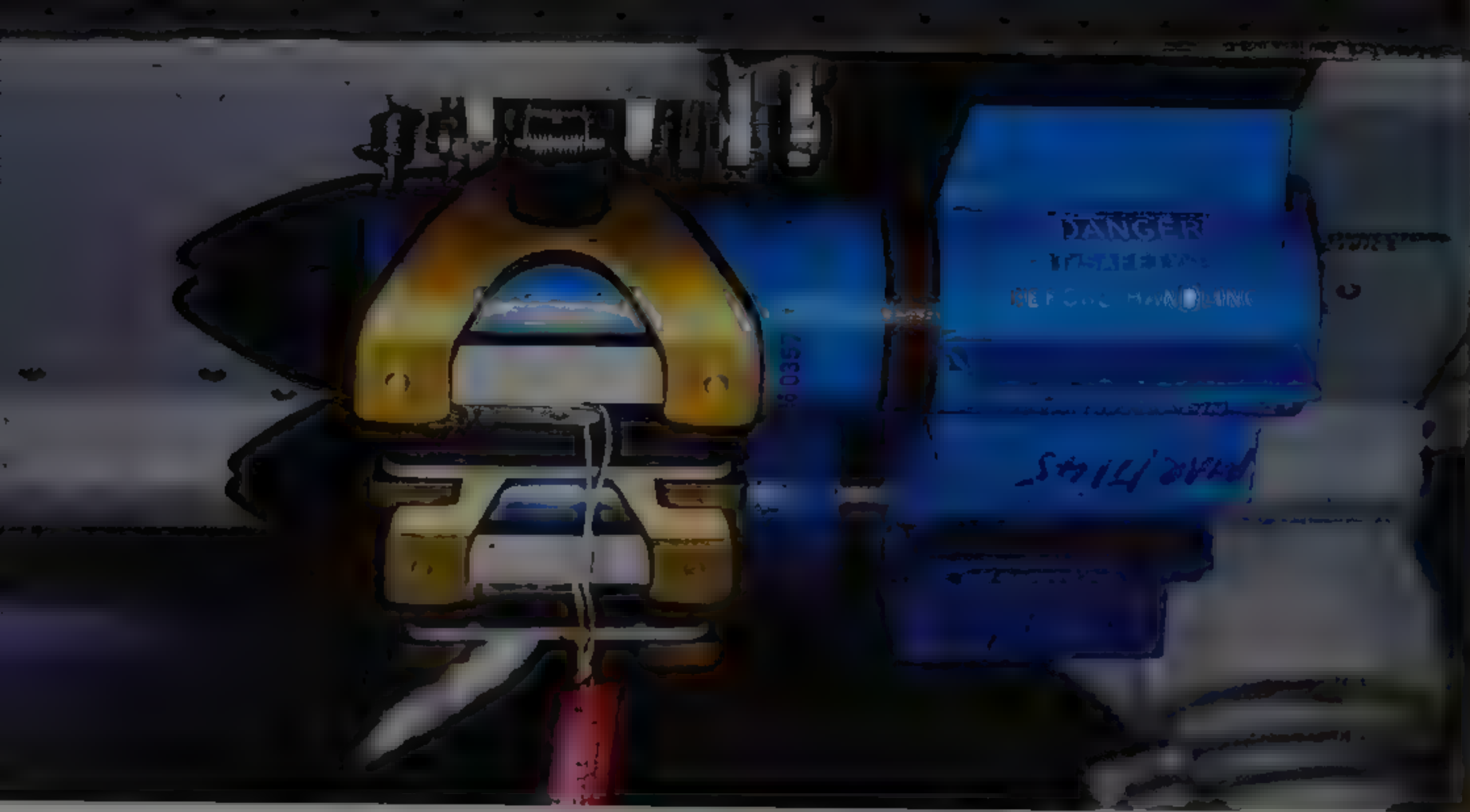




Delivery of ordnance, whether it be bomb, rocket or cannon shell, demands practice for the requisite skills to be maintained. Bombing and gunnery ranges are frequently visited so as to "stay sharp" which puts a heavy burden on armourers. Anti-clockwise from the left, these pictures show shells being readied for loading in a Harrier, a ground crew hard at work on a Phantom gun pack and armourers loading rockets into a Harrier pod. Finally, at right, a clutch of blue practice bombs are seen in a Tornado weapons carrier just before departure for a visit to the range.



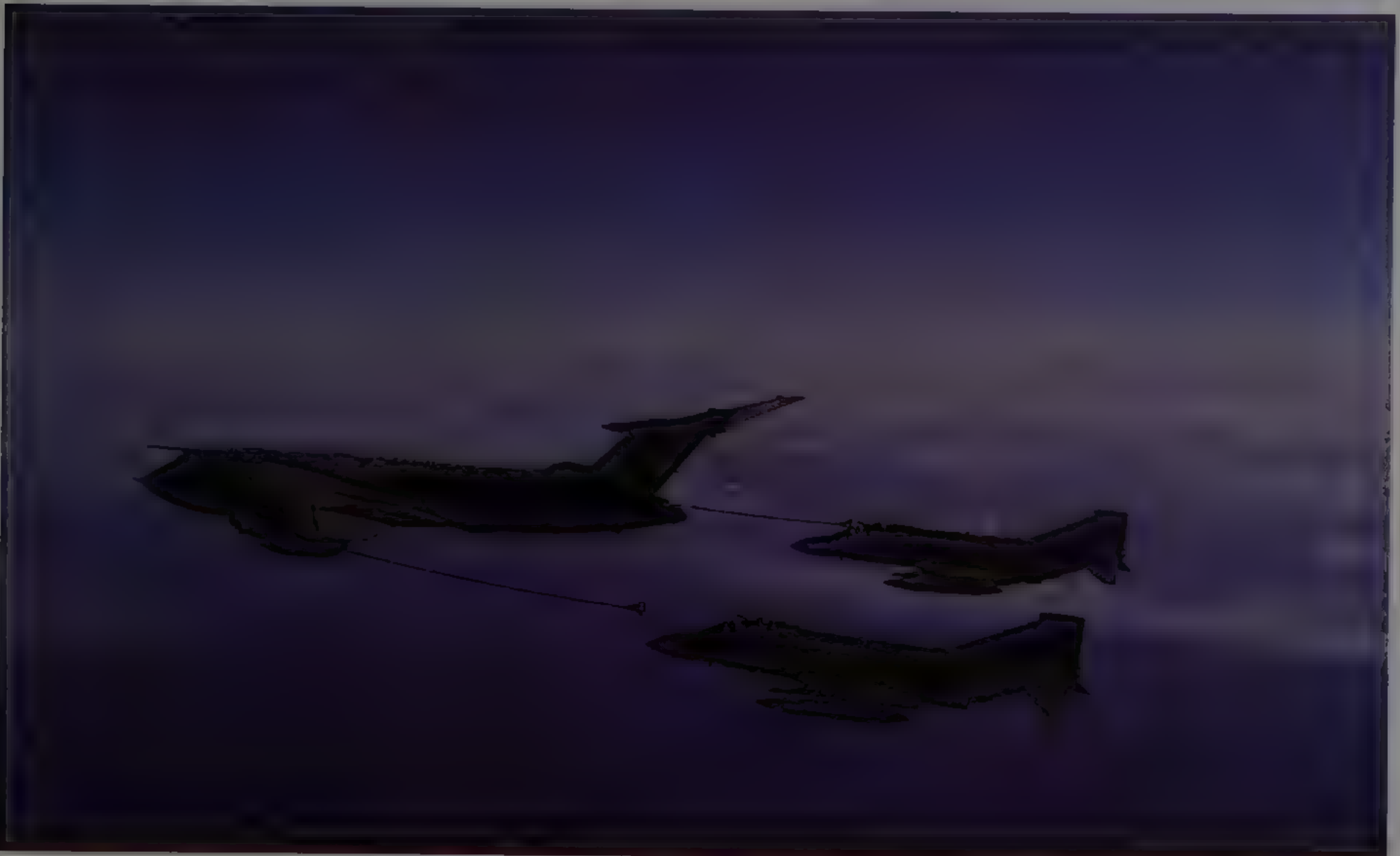






Aerial refuelling is one way in which the capabilities of both offensive and defensive warplanes can be extended to a significant degree, whether it be by "probe and drogue" or the US-preferred "flying boom" system. Both methods of effecting transfer of fuel in flight are shown here, with the picture at right being of a USAF General Dynamics F-111 nicely stabilised and waiting to receive a "top-up" from a Strategic Air Command KC-10A Extender. Opposite, a KC-135R is seen as it replenishes the tanks of a SAC B-1B somewhere over the USA (top) and a pair of No.111 Squadron RAF Phantoms have their probes extended as they approach the "baskets" that trail from a Victor K.2 tanker of No.55 Squadron high above the North Sea (bottom).





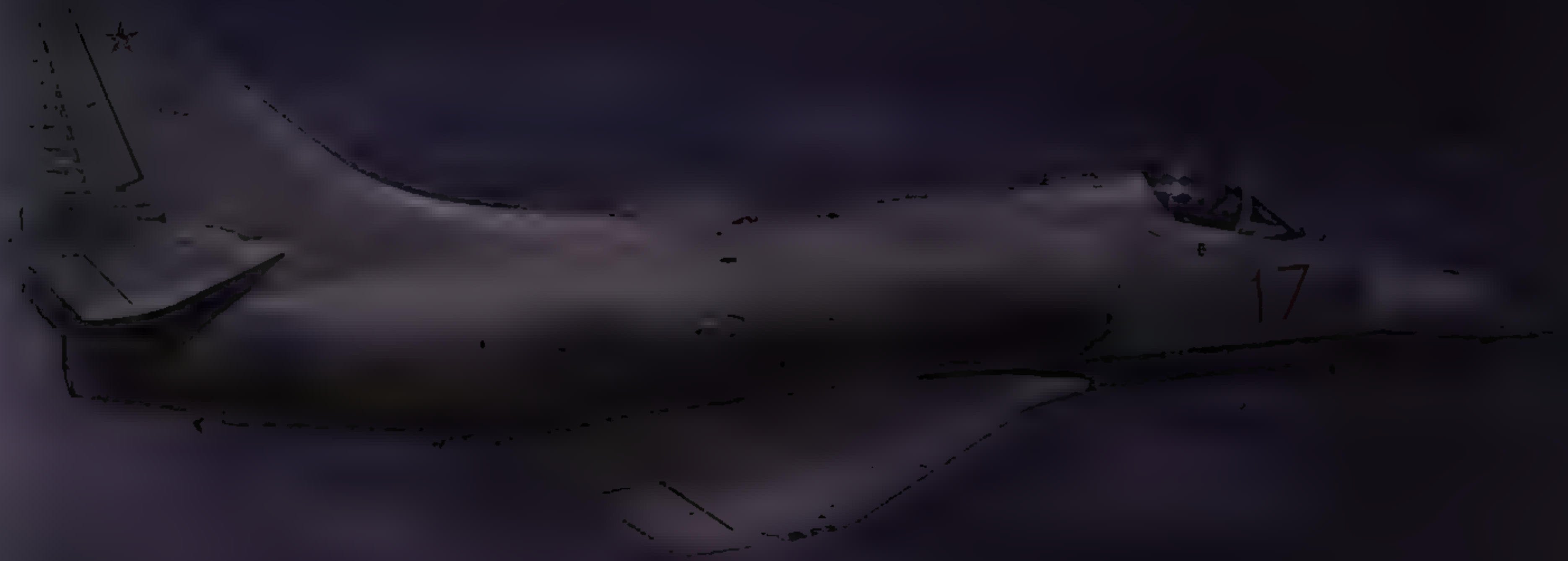




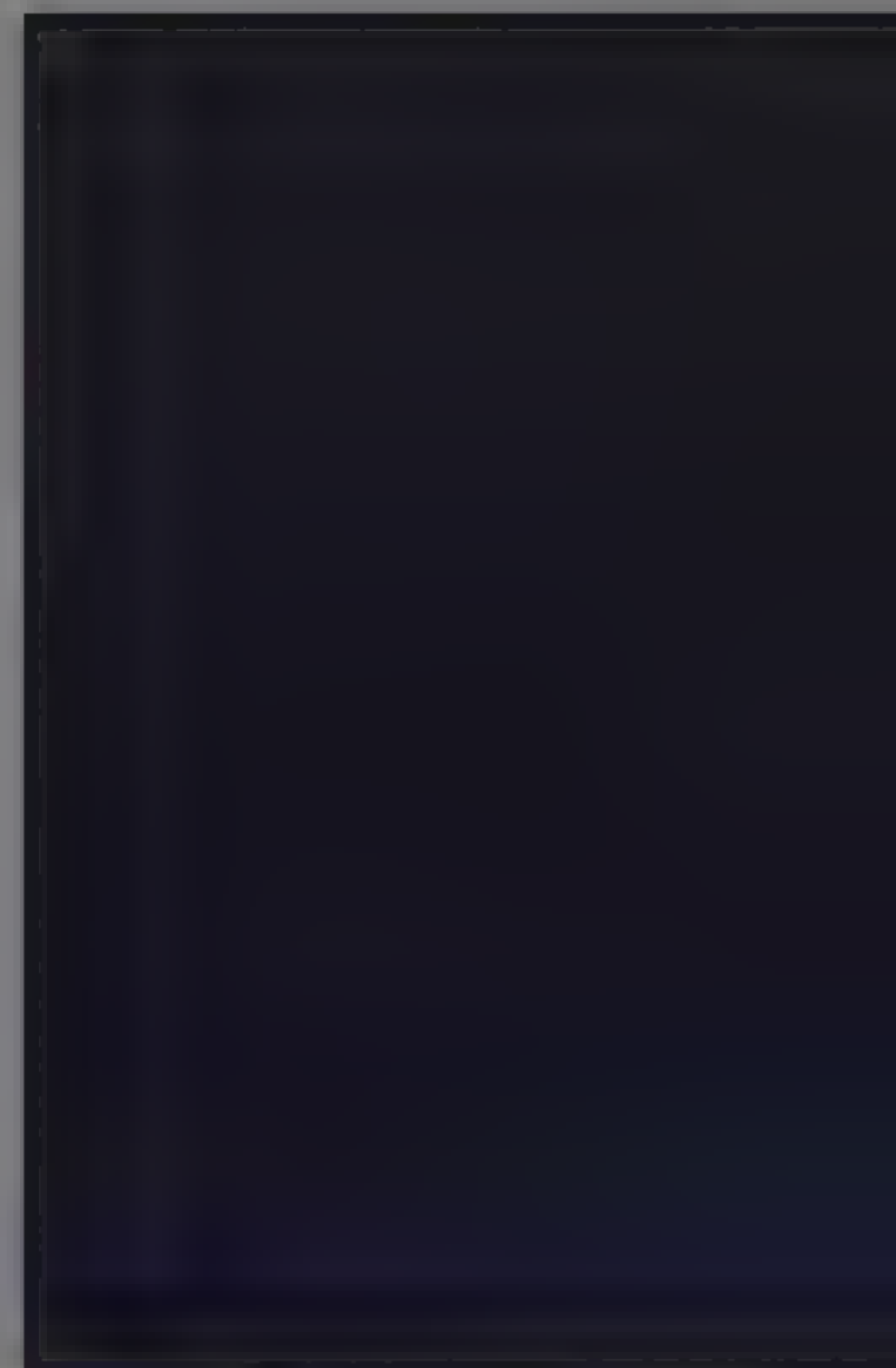


Exercises like "Red Flag" and competitive events like the "William Tell" weapons meet enable US fighter pilots to stay up to speed and members of the Eagle-driver community invariably feature in events of this kind. Pressure is an inevitable aspect of both, an F-15 pilot (opposite) having to rush to make his allotted take-off time at Nelli when a technical problem forced a switch of aircraft at almost the last minute. Elsewhere, a USAFE F-15C from the 36th TFW totes a clutch of Sidewinders and Sparrows as it heads for a live "missile shoot" at a drone target over the weapons range adjacent to Tyndall AFB in Florida (left) while the view below gives some idea of the excellent visibility from the F-15's cockpit.



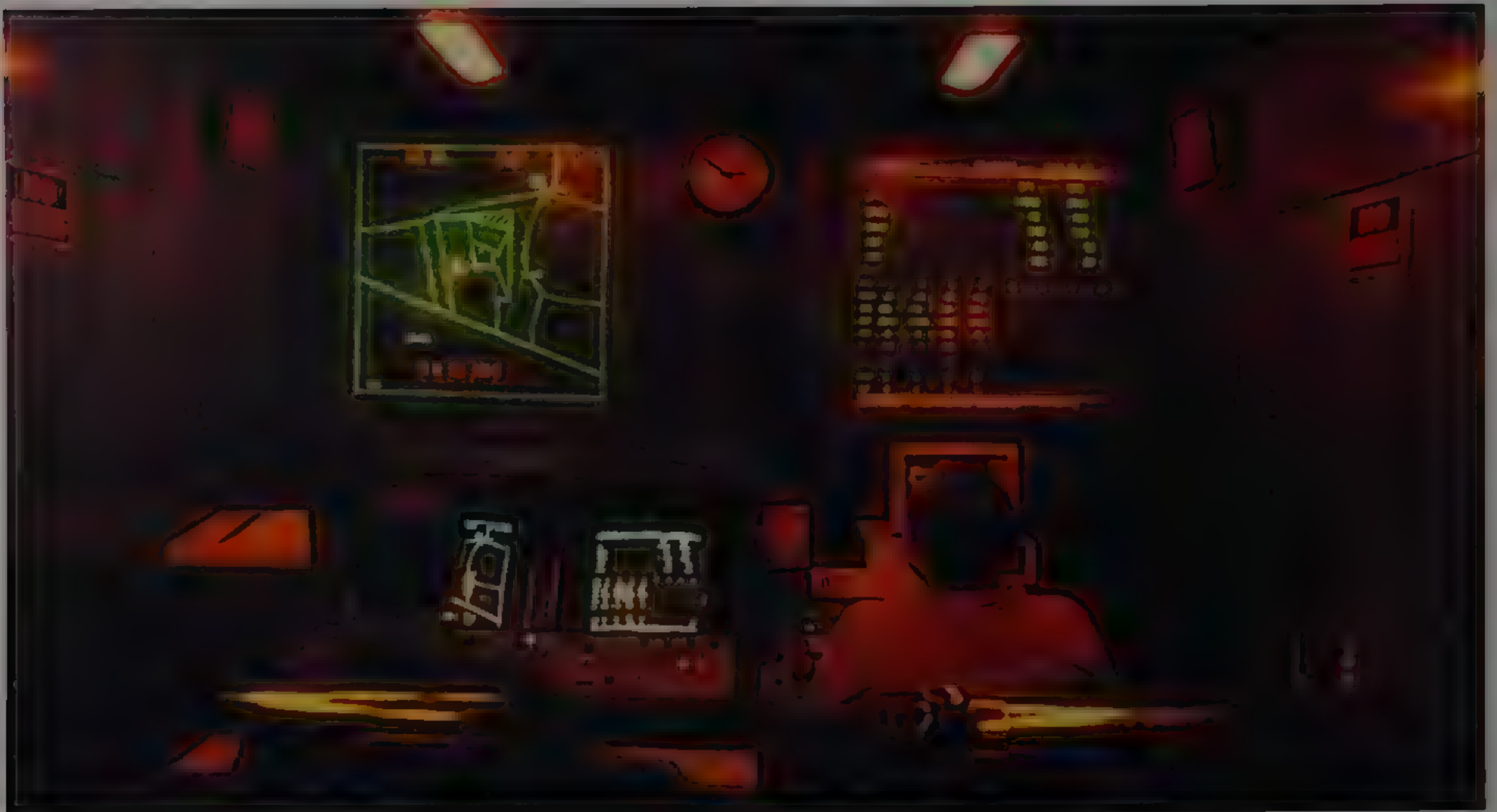


Beware the aggressors! One of a number of dedicated US Navy aggressor training aircraft, the A-4E Skyhawk shown above is wearing typical multi-hued camouflage and also carries a Soviet-style red star marking on its fin. Other types which are used by the US Navy for this job include the Northrop F-5E and the General Dynamics F-16N but the US Air Force is now about to abandon its own aggressor training programme as a cost-cutting measure. In the other views, a Tornado (top) and an F-5E (bottom) are quite clearly about to be "blown away" during simulated air combat.











Sophisticated computer-based technology is not confined to purely warlike objectives for it has an increasingly useful role to play in the training of aircrew. The American Red Flag Measurement and Debriefing system allows exercise combat action to be stored and displayed in detail, with video screens showing the real-time progress of a "battle" or a computer generated view from the cockpit of any participating aircraft. RFMDS sensor pods, such as that shown above on an RAF Phantom FGR.2 continuously relay data to the computer systems which create the "big picture" (left).









Pilotless drone targets are a useful aid to the testing of new weapons and for assessing aircrew in missile exercises. Three types of US target are shown, the Sabres at top left being used by the Army while the QF-100 (left) and PQM-102 (above) are Air Force owned.

(Overleaf) High over the blue waters of the Pacific Ocean, a B-1B cruises serenely along as it prepares to take on a fresh load of fuel from a SAC tanker. This peaceful scene belies the purpose of the B-1 which is nothing more than to visit destruction from the skies.

















